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COMPETITIVE ASSESSMENT OF THE U.S. BALL AND ROLLER BEARING INDUSTRY

ORIGINAL

Report on
Investigation No. 332-211
Under Section 332(b) of the
Tariff Act of 1930

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UNITED STATES INTERNATIONAL TRADE COMMISSION

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PREFACE

Following receipt of a request dated March 29, 1985, from the Chairman of the Subcommittee on Trade of the House Committee on Ways and Means (app. A), the Commission instituted investigation No. 332-211, Competitive Assessment of the U.S. Ball and Roller Bearing Industry, under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)), for the purpose of gathering information in order that it might report by January 2, 1986, to the Subcommittee, on the competitive position in domestic and world markets of the U.S. industry producing antifriction balls and rollers and ball and roller bearings. As requested by the Subcommittee on Trade, the Commission's analysis covers, as fully as available data permit, the following points: (1) current profile of the U.S. and major foreign ball and roller bearing industries; (2) a profile and current status of the U.S. and major foreign markets; (3) conditions of competition between the U.S. and foreign industries; and (4) future trends and markets for these products.

Notice of the investigation, including the public hearing, was given by posting copies of the notice of investigation at the Office of the Secretary, U.S. International Trade Commission, Washington, DC, and by publishing the notice in the Federal Register (50 F.R. 6169) (app. B) of April 24, 1985. The calendar of the public hearing appears in appendix C.

In the course of this investigation, the Commission collected data from questionnaires received from 38 U.S. producers, 32 importers, and 70 purchasers of ball and roller bearings and parts. In addition, U.S. Department of State airgrams were sent to U.S. embassies in countries that are major producers of these products. Other information was obtained from published sources, from interviews with corporate executives representing producers, importers, and purchasers of ball and roller bearings, from trade associations; from Government agencies, and from the Commission's files.

The information and analysis in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under other statutory authority covering the same or similar matter.

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EXECUTIVE SUMMARY

The Subcommittee on Trade of the House Committee on Ways and Means has recently expressed concern about the decline in U.S. competitiveness in the ball and roller bearing industry. This study was initiated in response to this concern and it analyzes the conditions of competition between U.S. and foreign industries, assesses relevant major country markets, and examines future trends and markets for industry products.

In 1984, the United States was by far the world's largest producer (47 percent), consumer (57 percent), and importer (28 percent) of ball and roller bearings. It is the third largest exporter after West Germany and Japan.

From January 1980 to June 1985, the industry has experienced many changes. World production declined 20 percent in the face of a slump in demand caused by the 1982-83 world recession. By 1984 and January-June 1985, U.S. industry sales were still about 6 percent below the 1981 peak of $3.4 billion. For 1984, exports were off 13 percent, and imports were up 28 percent from 1981 levels. Import penetration in the United States increased from 14.5 to 16.6 percent of domestic consumption, between 1980 and 1984, but its impact was heavily concentrated in low value, high volume products.

The domestic industry generally limited erosion of its U.S. market share by lowering prices toward those of imports, which were benefiting from the effects of the strong dollar. Profits fell 79 percent from 1981 to 1983, to a low of 2.2 percent of net sales, recovered sharply to 7.6 percent in 1984, but slumped again in January-June 1985 to 5.6 percent. These declines reduced the industry's ability to finance investment, which fell 45 percent. Even so, the industry remained profitable, with all but 8 of 38 firms reporting operating profits. Modernized specialized product producers maintained the highest level profits before taxes, of nearly 7 percent of net sales in 1982-83, recovering to around 10 percent in 1984-85.

The industry responded to competitive pressures mainly by cutting labor and costs, concentrating its limited investments in new manufacturing technologies, selling off certain production units (some to foreign producers) and increasing its 1980-84 R&D investment by 50 percent, to about 2 percent of sales. After the strong recovery in 1984, the first half of 1985 produced a sharp increase in import competition. The recent decline in dollar strength may improve prospects somewhat, but concerns linger that erosion of profits, investment cutbacks, and losses of sales to increased imports of products containing bearings all weaken the domestic industry's long-term competitive strength. Table A presents an industry and market profile for 1980-84.

- o U.S. bearing producers' shipments increased during 1980-84 but declined during January-June 1985 (as measured in current dollars) with shifts among some major products.

U.S. producers' shipments of ball and roller bearings and parts increased from $3.3 billion in 1980 to $3.6 billion in 1984, or by 11 percent. However, shipments were down 2 percent during January-June 1985 compared with

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Table A.—Profile of U.S. ball and roller bearing industry and markets, 1980-84

Item	1980	1981	1982	1983	1984	Absolute change, 1984 from 1980	Percentage change, 1984 from 1980
Net sales---million dollars	2,989	3,355	2,676	2,668	3,273	+284	+9.5
Operating profits---do	278	283	72	60	248	-30	-10.8
Ratio of gross profit to net sales---percent	19.1	19.6	16.7	15.9	19.9	+0.8	1/
Ratio of net profit to net sales---percent	7.1	7.2	2.6	1.3	5.1	-2.0	1/
Capital expenditures, domestic:							
Total---million dollars	267	238	176	115	129	-138	-51.7
Ratio of domestic capital expenditures to total net sales---percent	8.9	7.1	6.6	4.3	3.9	-5.0	1/
Research and development:							
Total---million dollars	36	43	47	48	54	+18	+50.0
Ratio of research and development to total net sales---percent	1.2	1.3	1.8	1.8	1.7	+0.5	1/
Capacity utilization:							
Ball bearings, complete ---percent	74.1	74.1	55.6	62.5	71.3	-2.8	1/
Cups for tapered roller bearings---percent	68.2	90.3	56.5	62.2	70.1	+1.9	1/
Cone and roller assemblies for tapered roller bearings---percent	70.1	86.0	59.0	59.0	71.4	+1.3	1/
Employment:							
Total---number	53,097	51,653	42,377	37,855	43,242	-9,855	-18.6
Production workers---do	45,601	44,456	35,367	31,717	36,515	-9,086	-19.9
Shipments:							
Questionnaire ---million dollars	2,767	3,135	2,525	2,546	3,112	+345	+12.5
Census---do	3,262	3,582	2,891	2,956	3,627	+365	+11.2
Exports:							
Questionnaire ---million dollars	205	212	161	135	178	-27	-13.2
Census---do	369	382	310	253	331	-38	-10.3
Ratio of exports to shipments:							
Questionnaire---percent	7.4	6.8	6.4	5.3	5.8	-1.6	1/
Census---do	11.3	10.7	10.7	8.6	9.1	-2.2	1/
Imports:							
Questionnaire ---million dollars	252	303	288	384	632	+380	+150.8
Census---do	489	485	454	423	628	+139	+28.4
Consumption:							
Questionnaire ---million dollars	2,814	3,226	2,652	2,795	3,566	+752	+26.7
Census---do	3,382	3,685	3,035	3,126	3,924	+789	+23.6
Trade balance:							
Questionnaire ---million dollars	-47	-87	-127	-249	-454	-407	-866.0
Census---do	-120	-103	-144	-170	-297	-177	-147.5
Imports to consumption ratio:							
Questionnaire---percent	9.0	9.4	10.9	13.7	17.7	+8.7	1/
Census---do	14.5	13.1	15.0	13.5	16.0	+1.5	1/

1/ Not applicable.

Source: All data were provided in (or derived from) questionnaires provided to the U.S. International Trade Commission by U.S. producers and importers of ball and roller bearings and parts, except for data provided in (or derived from) official statistics of the Bureau of the Census, U.S. Department of Commerce (identified in table 1 as "Census").

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January-June 1984. Tapered roller bearings and parts were the only major type of bearing to experience a decline during 1980-84, decreasing by 4 percent to $879.5 million in 1984. This decrease was caused largely by a decision by the automotive industry to change its product mix in favor of lighter cars and trucks that utilize more ball bearings and less tapered roller bearings. It was also largely influenced by an increase in imports of tapered roller bearings, cups, and cones. The ratio of U.S. imports to consumption for these products rose from 8.0 percent in 1980 to 17.5 percent in 1984 (see pp. 24 and 62).

- The U.S. bearing industry, despite intense import competition, has maintained capacity, but utilization of capacity and investment has fallen drastically.

U.S. producers have been more affected by imports of low-value added, mass-produced bearings than by imports of higher value-added "specialty bearings." Annual capital investment by the U.S. bearing industry fell $138 million during 1980-84, or by 52 percent overall. Questionnaire data reveal that despite intense import competition and declining capital investment, U.S. firms have maintained production capacity (see p. 26).

- U.S. exports to most major world markets declined during January 1980-June 1985.

U.S. exports of ball and roller bearings declined considerably during January 1980-June 1985. Export declines occurred in 7 of the top 10 U.S. export markets during 1984. The major declines in the value of U.S. exports occurred in France, Mexico, Brazil and the Republic of South Africa (see p. 26).

- U.S. ball and roller bearing employment decreased during 1980-84; increased imports especially during 1984 and January-June 1985 probably resulted in a loss of employment opportunities of over 2,000 jobs.

Overall, employment in the industry declined by 18.6 percent during 1980-84. Much of this decline was due to the depressed industrial sector markets for bearings, the restructuring in the industry to reduce labor-intensive processes, and increased automation. In addition, it is estimated that imports of bearings (whether imported separately or incorporated into finished products) probably were responsible for the loss of 2,198 jobs in the bearing industry during 1980-85. However, since the increase in imports was most pronounced during January-June 1985, most of the lost estimated employment opportunities 1/ occurred in these months. For comparison, from January 1984 to June 1985, respondents to the Commission's questionnaire reported 2,777 jobs lost in the U.S. bearing industry (see pp. 29 and 73).

1/ Based on the Bureau of Labor Statistics' Input-Output Model.

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- R&D expenditures increased significantly; U.S. firms adopted advances in manufacturing technology.

Despite falling levels of overall investment, R&D expenditures in the U.S. ball and roller bearing industry increased from $35.6 million in 1980 to $53.8 million in 1984 and increased by 12 percent to $29.2 million during January-June 1985 compared with the corresponding period in 1984. U.S. producers have been successful in integrating new manufacturing technologies, such as computerized systems and robotics, into their production processes (see p. 43).

- Major world markets are dominated by a small number of firms, with Swedish, U.S., West German, and Japanese firms most prominent.

Sweden claims to be the world's largest manufacturer of ball and roller bearings; yet data available indicate it ranks only about sixth in domestic production, seventh in exports, and eighth in imports. The explanation seems to lie in the Swedish practice of supplying foreign markets from production facilities in those foreign markets, a dominant practice in Sweden's conduct of business. Sweden has, for example, extensive production facilities in the United States, with SKF, self-proclaimed as the world's largest producer, being the most prominent. Even though Sweden was an almost insignificant exporter to the United States, with only 2 percent of U.S. imports in 1984, when discussing main competitors, Sweden was the third most frequently mentioned among those in the U.S. market. It was cited in more categories of bearings parts than any other country. Available evidence is that Swedish producers located in the United States constitute one of the leading forces in the market, although they have suffered recently from import competition. In response, SKF is currently restructuring its U.S. operations (see pp. 45 and 58).

West Germany's ball bearing industry is dominated by three large firms. This high degree of industrial concentration has not necessarily protected the industry, however, because West German production of bearings has declined in the past 4 years (see p. 45).

By contrast, Japan's ball and roller bearing industry increased total production from 1980 to 1984, albeit modestly. Between 80 and 90 percent of its production in ball and roller bearings was accounted for by five producers. Exports to the U.S. market have grown considerably. The U.S. share of Japan's exports increased from 28 percent in 1980 to 33 percent in 1983. Japanese firms have also augmented direct exports with acquisitions of bearing plants in the United States. They also accounted for the majority of bearings installed in products imported into the United States (mainly automobiles). At the same time, imports have remained insiginficant, increasing from 0.4 percent of Japan's consumption in 1978 to 0.8 percent in 1983.

The Canadian industry, although not in the top rank of volume producers, was the third largest supplier to the United States. Its U.S. sales accounted for roughly 10 percent of U.S. imports, and 87 percent of Canadian exports.

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- o The U.S. market for bearings is dominated by a few producing industries.

The U.S. market for bearings consists primarily of the producers of motor vehicles and most other types of machinery and equipment, especially farm and construction equipment, and aircraft and parts. Therefore, during 1982-83, the U.S. industry was adversely affected by cyclical downturns in these industries as well as by the long-term trend of increased imports of products that contain bearings (see pp. 58-60).

- o Apparent U.S. consumption of ball and roller bearings and parts declined during 1980-82, but rose in 1984 as the demand increased in replacement markets.

Apparent U.S. consumption of ball and roller bearings and parts decreased from $3.4 billion in 1980 to $3.0 billion in 1982 and then rose to $3.9 billion in 1984, according to statistics of the U.S. Department of Commerce. During this period, apparent consumption of parts and components for ball and roller bearings, including rollers and balls sold separately, displayed the largest increase, rising from $328 million in 1980 to $426 million in 1984. A contributing factor to this significant increase in consumption for bearing parts was the upturn in the bearing-replacement market as users repaired old machinery instead of purchasing new machinery. The substantial increase in consumption in 1984 for all types of ball and roller bearings was in response to increased demand by producers in the automotive, construction, metalworking, and aircraft industries (see pp. 67 and 69).

- o Imports of ball and roller bearings and parts accounted for an increasing share of U.S. consumption during 1980-84; imports also increased significantly during January-June 1985, with major gains recorded for tapered roller bearings.

Imports have captured a growing share of U.S. apparent domestic consumption of high-volume bearing lines. From 1980 to 1984, imports of all ball and roller bearings and parts increased from $489 million to $628 million in 1984. The ratio of U.S. imports to consumption for ball or roller bearings and parts rose from 14.5 percent in 1980 to 16.0 percent during 1984. During that period, imports of complete tapered roller bearings and of cups and cones increased 139 percent, rising from $66 million (14 percent of all imports of ball and roller bearings and parts) to $158 million (25 percent). As a result of this significant increase, the ratio of imports to consumption of tapered roller bearings increased from 8.0 percent in 1980 to 17.5 percent during 1984. By comparison, ball bearings, complete, rose from $263 million to $295 million, but lagged overall growth and fell from 55 percent of imports in 1980 to 47 percent in 1984.

Import competition occurred initially in the high-volume OEM market, but now it is increasing somewhat in the distributor/aftermarket channel.

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- o Leading suppliers to the U.S. market were Japan, West Germany, Canada, and Singapore.

Japan, the principal supplier of U.S. imported bearings, increased its share of U.S. imports from 38 percent in 1980 to 47 percent in 1984 and to 49 percent during January-June 1985. West Germany was the second leading supplier, but its share of the U.S. import market declined from 17 percent in 1982 to 16 percent in 1984. Other significant suppliers included Canada and Singapore. During this period, Canada's share of the U.S. import market ranged from a low of 9 percent during January-June 1985 to a high of 12 percent in 1983, whereas Singapore accounted for 3 percent in 1981 and 6 percent in 1982-83 (see p. 64).

- o U.S. producers increased imports and formed joint ventures in response to import competition.

Data obtained by respondents to the Commission's questionnaires indicate that 12 U.S. ball bearing producers and 7 U.S. roller bearing producers have themselves started to import in response to the increased competition in the U.S. market from other imported ball and roller bearings and parts. Imports by domestic producers accounted for 56 percent, by value, of total bearing imports in 1984. Increased imports can also be attributed to the rise of joint ventures between U.S. and foreign bearing producers. This has led to increased imports of certain types of bearings that are produced in large volumes overseas and, in some cases, marketed through channels of distribution in the United States that were established by the U.S. producers (see p. 64).

- o The U.S. bearing producers face a competitive disadvantage in regards to the availability and price of U.S.-produced and imported bearing steel.

The high cost of steel has become a major concern for the U.S. bearing industry because materials account for such a significant part of the cost of producing bearings. U.S. bearing producers import most of their steel because domestic steel is higher priced and/or not available in sufficient quantities at the quality grades needed for bearings. Japanese and European bearing producers benefit from lower priced, locally procured steel (see p. 95).

- o U.S. producers state that they have improved the quality of their bearings in response to import competition.

According to respondents to the Commission's questionnaire, 26 out of 29 producers have improved the quality of their bearings in response to increased competition in the U.S. market from foreign-made ball and roller bearings and parts. Of the 29 respondents, 9 shifted production to more advanced types of bearings (see p. 94).

- o Japanese and West German bearing producers were reported to have an overall competitive advantage over U.S. bearing producers.

Both U.S. bearing producers and importers, responding to the Commission's questionnaire, indicated that Japanese and West German bearing producers had

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an overall competitive advantage over U.S. bearing producers in the U.S. market. Furthermore, U.S. bearing producers stated that producers from these countries enjoyed a significant competitive advantage in other world markets. Although U.S. producers indicated that Japanese-produced and West German-produced bearings have the overall competitive advantage in the U.S. market, such producers reported more of the product-related features (including availability of product on short notice, reliability of supplier, service, availability of parts, historical supplier relationship, technical features and performance characteristics, and engineering and design assistance) favored them.

However, U.S. producers gave the competitive advantages in these product-related features in foreign markets in most cases to their Japanese and West German competitors and indicated a competitive advantage belonged to U.S. producers only with respect to roller bearings in regard to service, technical features and performance characteristics, and engineering and design assistance. U.S. imports, as well, with respect to the U.S. market, favored the Japanese and West German suppliers, except for roller bearings in the above-mentioned three product-related features (see p. 96).

- o <u>During 1980-84, U.S. trade in bearings with Japan, West Germany, Canada, and the United Kingdom was affected by economic activity in the United States; such trade and its relationship to exchange rate fluctuations is inconclusive</u>.

It is generally believed that the appreciation of the U.S. dollar in foreign exchange markets has had an important effect on the competitive position of U.S. products. From January 1980 to March 1985, the U.S. dollar appreciated 29 percent relative to the Japanese yen and 91 percent with respect to the West German mark. While such currency realignments were alleged to have led to lower prices and/or higher profits on sales of imported bearings in the United States, it is not possible to conclude that a direct relationship exists between the value of the U.S. dollar and U.S. bilateral trade with countries that are major bearing competitors. Rather, findings in the Commission's study that compared the trend in import and export quantities for trade between the United States and four countries (Japan, West Germany, Canada, and the United Kingdom) with several economic indicators, including real-currency exchange-rate indexes illustrated that changes in demand on bearing trade was a major factor affecting trade. For these four countries, imports of bearings declined after 1981 and, again for each country, imports began to recover or started to increase after 1983. These trends closely paralleled changes in the level of economic activity in the United States (see pp. 83-86).

- o <u>Future: The industry faces change and uncertainty in markets, technology, and competitive forces</u>.

The outlook for the U.S. industry is dominated by the general level of U.S. economic activity and by prospects for the auto industry in particular.

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Slow current sales of domestic autos, increased production in the United States by foreign automotive firms, and intensifying import competition from autos with embodied foreign bearings dampen the near term outlook for sales to the automotive market. High levels of R&D investment and a variety of promising technology research and development efforts enhance the outlook for continuing significant changes in products and production tech- niques. Whether U.S.-owned producers are even or ahead in present technologies, it remains unclear whether they have a lead in developing and applying new technolgies. The recent decline in the dollar's strength appears to be the most favorable feature now visible on the horizon.

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The World Industry and World Market

World production 1/

During 1978-84, the United States, Japan, and West Germany were the three largest free-world producers 2/ of ball and roller bearings (fig. 1). U.S. production climbed irregularly from $2.8 billion in 1978 to $3.6 billion in 1984, representing a 30.5 percent increase. Japan's production of ball and roller bearings rose steadily from nearly $1.4 billion in 1978 to almost $2.0 billion in 1984, representing a 36-percent increase; and, West Germany's production averaged $1.4 billion during the 7-year period, fluctuating from a low of less than $1.3 billion in 1978 to a high of $1.7 billion in 1980.

Production in the six major free-world ball- and roller-bearing-producing countries 3/ remained relatively stable fluctuating between $6.6 billion in 1978 and $8.3 billion in 1980, as shown in the following tabulation (in billions of dollars): 4/

	Major bearing-producing countries' production U.S. equivalent
1978	6.6
1979	7.6
1980	8.3
1981	7.8
1982	6.9
1983	6.7
1984	7.7
Total	51.6

Production among the top six producing countries dropped slightly, reflecting the beginning of a worldwide recession, from the 1980 high of $8.3 billion to $7.8 billion in 1981 and then fell to $6.7 billion in 1983. 5/ As worldwide economic recovery expanded in 1984, particularly in the automotive industry, production of ball and roller bearings increased by 15 percent to $7.7 billion in 1984.

1/ For the purpose of this analysis, the terms "production" and "shipments" are used interchangeably. According to industry sources, production (except of parts) is not generally determined to be completed until such time as the final end user is known so that the ball and roller bearings can be prepared to meet the customer's specifications. Consequently, shipments should approximate production in any given year.

2/ Total world production data are not available.

3/ The six are the United States, West Germany, Japan, France, the United Kingdom, and Sweden. Italy is not included because production data are only available in quantity (metric tons), rather than in value.

4/ Source: Japan Economic Yearbook; United States Current Industrial Reports, MA35--Q; United Kingdom statistics from CSO Annual Abstract of Statistics, 1982; and U.S. Department of State airgrams.

5/ If adjusted for inflation, the decline in production during 1981-83 would be more precipitous.

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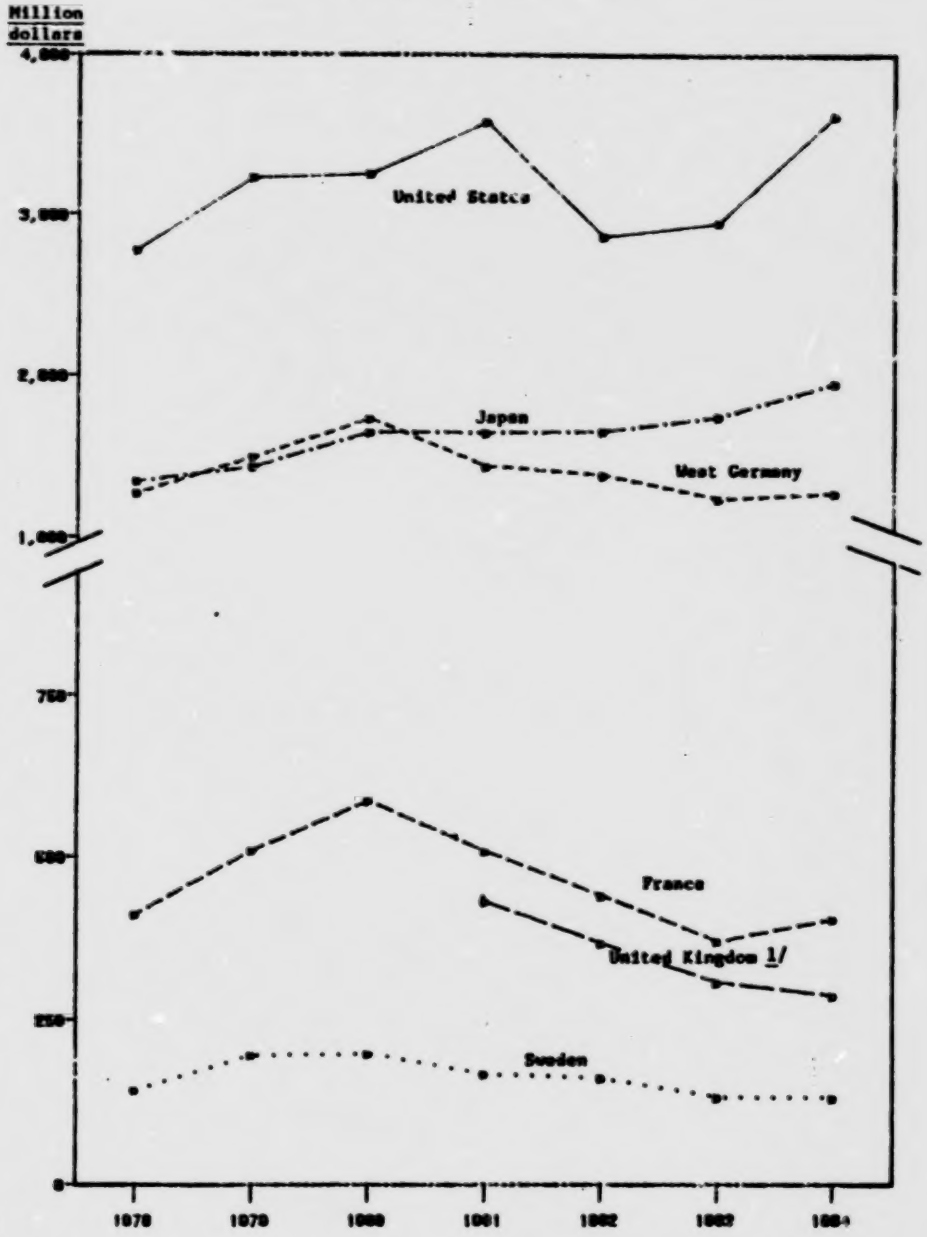
Figure 1.—Ball and roller bearings: World production, by specified countries, 1978-84.



1/ Not available for 1978-80.

Source: Compiled from Japan Economic Yearbook, CSO Annual Abstract of Statistics, 1982, U.S. Department of State Airgrams, and official statistics of the U.S. Department of Commerce.

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In 1978, the three leading bearing-producing countries, the United States, West Germany, and Japan, together accounted for 83 percent of total production for the six countries shown in figure 1. By 1984, these three countries had increased their share of production to 95 percent. The U.S. share of total world production increased 5 percentage points during the period, from 42 percent to 47 percent; West Germany's share fell 3 percentage points, decreasing from 20 percent in 1978 to 17 percent in 1984; and Japan's share increased steadily, from 21 percent in 1978 to 26 percent in 1984.

Because of the strong appreciation of the U.S. dollar relative to foreign currencies in the period 1978-84, the production data (converted to dollars) shown in figure 1 disguises the significant production changes that have occurred in the major bearing producing countries. When annual percentage increases and decreases of bearing production of major world producing countries are calculated based on the currency of those countries, a different picture appears as shown in figure 2. For example, in contrast to figure 1 which shows French bearing production declining from 1980 through 1983, figure 2 shows French production steadily increasing 47 percentage points from 1978-84 when based on French Francs. Based on this approach, total production generally has been increasing from 1978-84 in each of the countries with the exception of 1980-81 for Japan, 1981-82 for the United States and 1982-83 for West Germany (fig. 2). U.S. production recorded the steepest decline among the countries in 1981-82, and thereafter, its production continued to rise. In fact, the increase in U.S. bearing production in 1983-84 was the greatest (23 percentage points) among any of the major bearing producing countries during this period.

World imports

Although annual imports, by most countries, of ball and roller bearings have remained relatively stable recently, growth in U.S. imports during 1983-84 was striking, increasing 47 percent from $444 million in 1983 to $654 million in 1984 (table 1). With few exceptions, most major bearing-importing countries increased their imports from 1978 to 1980, then decreased imports through 1983, reflecting a general downturn in the worldwide industrial cycle. As worldwide recession lessened and industrial production increased, imports began to rise in 1983.

World exports

West Germany and Japan ranked as the major exporters of ball and roller bearings during 1978-84 (table 2). During this period, West Germany's exports climbed from $586 million in 1978 to its highest level of $897 million in 1980, or by 53 percent, and then declined in each of the next 4 years, falling to $699 million in 1984. Japan's exports rose from $423 million in 1978 to $590 million in 1981, declined for the next 2 years, and then rose to their highest level of $658 million in 1984, representing a 56-percent increase over the 7-year period. The United States ranked third as an exporting country, with exports valued at $331 million in 1984. The other major exporting countries in 1984 were France ($243 million), the United Kingdom ($168 million), Italy ($196 million), and Sweden ($165 million). The peak years for exports during 1978-84 were, depending on the country, either 1980 or 1981.

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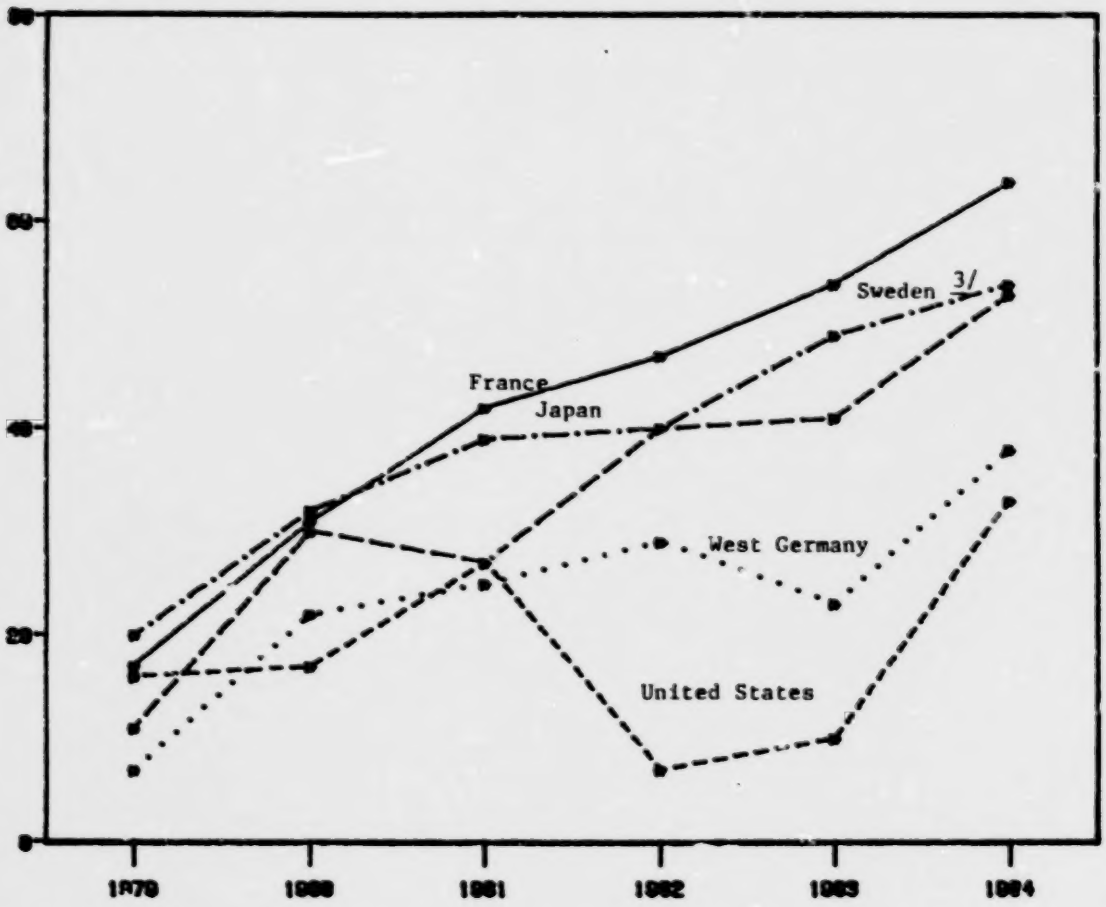
Figure 2.--Ball and roller bearings: Annual percentage changes in total domestic production valued in the currencies of major producing nations, 1/ 1979-84. 2/



1/ United Kingdom production percentage increases are not shown because production declined steadily from that in 1980.

2/ The base year is 1978.

3/ Swedish 1984 production data are based on estimates by the U.S. Department of Commerce.

Source: Compiled by the staff of the U.S. International Trade Commission on the basis of the Japan Economic Yearbook; United Kingdom Statistics from CSO Annual Abstract of Statistics; U.S. Department of State Airgrams; and official statistics of the U.S. Department of Commerce. When data were not available in currencies of the major-bearing producing countries, figures were converted by using the factors for conversion in International Monetary Fund, International Financial Statistics, May 1985, pp. 200, 208, 276, 434, and 472.

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Table 1.--Ball and roller bearings: World imports, by specified countries, 1978-84

(In millions of dollars)

Country	1978	1979	1980	1981	1982	1983	1984
United States	381	472	478	497	478	444	654
West Germany	270	344	427	366	347	333	364
France	215	246	317	263	244	211	211
Italy	167	211	312	269	186	190	221
Canada	129	195	207	212	165	169	225
United Kingdom	165	210	227	176	176	160	187
Brazil	83	105	134	136	90	1/ 34	2/
Sweden	79	107	125	114	105	100	105
Singapore	81	79	102	97	89	80	2/
Mexico	2/	68	1/ 104	1/ 109	1/ 74	1/ 84	2/
Spain	70	86	97	88	81	78	2/
South Africa	45	54	93	97	75	2/	2/
Australia	46	62	86	86	81	46	84
Belgium and Luxembourg	59	76	99	85	68	75	73
Netherlands	60	66	78	68	65	60	66
Switzerland	53	60	76	70	52	46	53
Japan	42	45	60	66	69	69	112

1/ Estimated by the staff of the U.S. International Trade Commission.
2/ Not available.

Source: United Nations, Yearbook of International Statistics, vol. 11, 1982 and 1983.

The level of exports as a share of total production for the six major bearing-producing countries varied considerably. West Germany, for example, consistently exported 50 percent or more of its production from 1978 to 1983 and exported 54 percent of its production in 1984 (fig. 3). During the same 7-year period, Japan exported about 33 percent of its total production, on the average. Conversely, during 1978-84, the United States exported between 8 and 11 percent of domestic production, making its ratio of exports to production the lowest among major bearing-producing exporting countries.

The export market is less important to the United States than to most other countries, in terms of total domestic ball and roller bearing production. The United Kingdom, for example, has steadily increased its production for export from a low of 26 percent in 1978 to a high of 59 percent in 1984. France's exports reached 62 percent of production in 1981 but fell to 60 percent in 1984.

World consumption

Apparent consumption of ball and roller bearings in the major bearing-producing countries totaled almost $7.0 billion in 1984, an increase of 19 percent, from $5.9 billion in 1978 (table 3). The United States was the

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Table 2.--Ball and roller bearings: World exports, by specified countries, 1978-84

(In millions of dollars)

Country	1978	1979	1980	1981	1982	1983	1984
West Germany	586	734	897	781	694	645	699
Japan	423	481	556	590	497	512	658
United States	236	296	374	386	318	261	331
France	213	276	329	318	247	219	243
United Kingdom	155	197	264	223	186	154	168
Italy	138	189	230	205	188	168	196
Sweden	143	180	214	195	166	151	165
Singapore	75	80	90	105	111	112	1/
Austria	50	66	83	77	74	62	65
Canada	41	51	52	67	57	63	70
Switzerland	50	59	66	54	46	48	51
Netherlands	34	40	49	38	40	39	41
Belgium and Luxembourg	16	20	36	33	24	28	26
Spain	13	12	20	18	15	13	1/
Panama	1/	2/ 5	2/ 21	2/ 14	2/ 13	2/ 106	1/

1/ Not available.
2/ Estimated by the staff of the U.S. International Trade Commission.

Source: United Nations, Yearbook of International Statistics, vol. 11, 1982 and 1983.

largest consumer of bearings during 1978-84, accounting for one-half or more of free-world consumption. In addition, growth in U.S. consumption was the most significant of the largest consuming countries, increasing to nearly $4.0 billion in 1984, up 35 percent from 1978. During 1978-84, Japan, the second largest bearing-consuming country, increased its consumption more than 46 percent, from $969 million in 1978 to $1.4 billion in 1984. Conversely, West Germany's consumption fluctuated between $961 million in 1978 and $1.3 billion in 1980, and then actually decreased, reaching its lowest level of $935 million in 1983. In 1984, West Germany's consumption rose slightly to $949 million. Apparent consumption also decreased during the period in France and the United Kingdom; the largest consumption year for both countries was 1980.

The share of domestic consumption accounted for by imports (commonly referred to as import penetration) varied widely among the major bearing-consuming nations. For most years during 1978-84, imports accounted for more than one-half of domestic bearing consumption in France and the United Kingdom (fig. 4); for West Germany it rose from 28 percent in 1978 to 38 percent in 1984; for the United States from 13 percent in 1978 to 17 percent in 1984; and for Japan, from 4 percent in 1978 to almost 8 percent in 1984.

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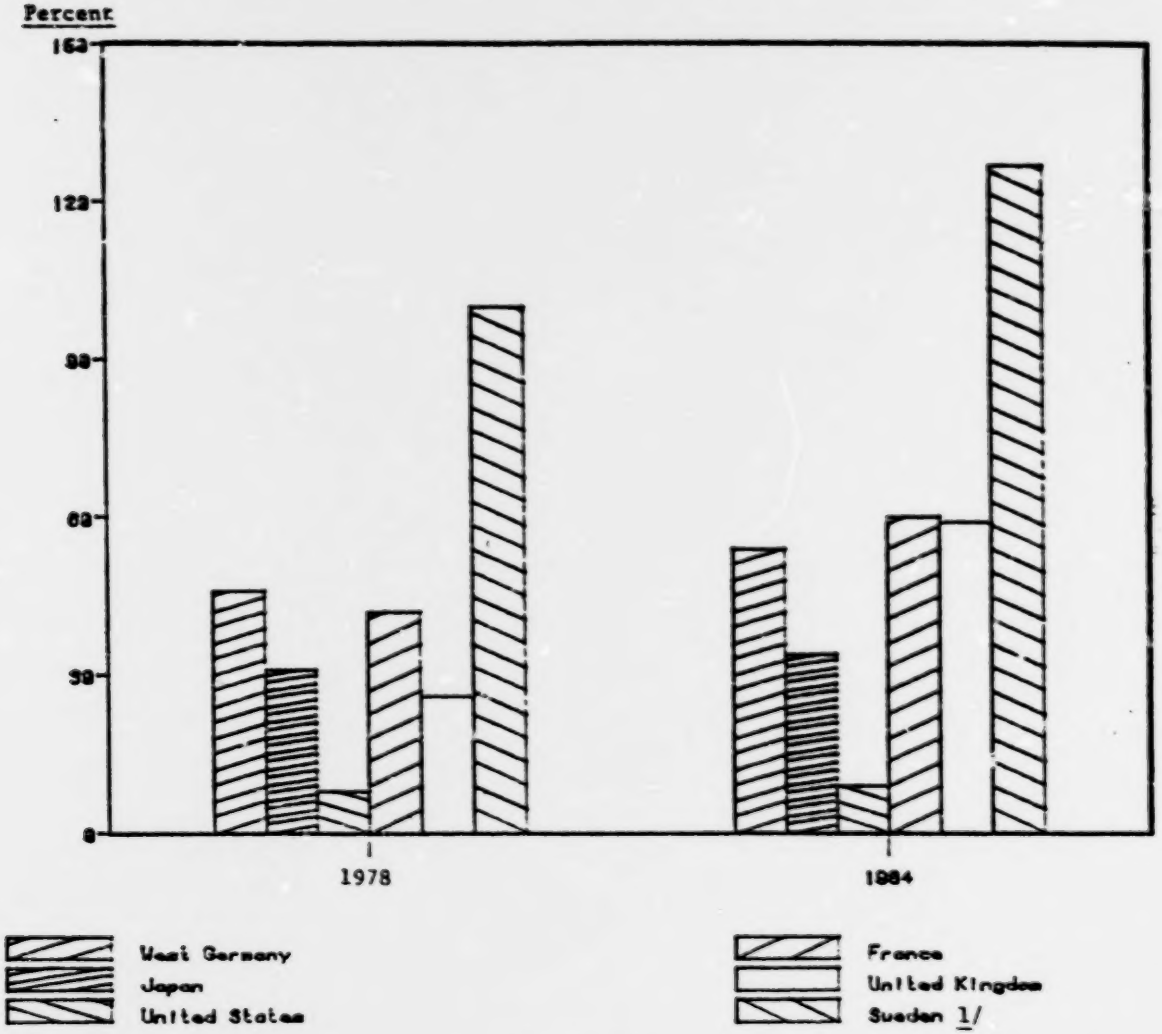
Figure 3.--Ball and roller bearings: Exports as a share of total production, by specified countries, 1978 and 1984.



1/ Available statistics from official sources are believed to overstate Sweden's exports and understate Sweden's domestic production, therefore, Sweden's exports as a share of domestic production may be overstated.

Source: Compiled from Japan Economic Yearbook, CSO Annual Abstract of Statistics, 1982, U.S. Department of State Airgrams, and official statistics of the U.S. Department of Commerce.

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Table 3.--Ball and roller bearings: Apparent consumption of major bearing-producing countries, 1978-84

(In millions of dollars)

Country	1978	1979	1980	1981	1982	1983	1984
United States 1/	2,925	3,414	3,366	3,694	3,029	3,139	3,950
West Germany	961	1,112	1,267	1,031	1,044	935	949
Japan	969	1,005	1,159	1,129	1,233	1,309	1,414
France	413	480	575	454	437	362	372
United Kingdom	601	702	793	384	357	313	306
Total	5,869	6,713	7,160	6,692	6,100	6,058	6,991

1/ These data differ slightly from other apparent consumption data appearing in this report. These data were derived from U.N. statistics for exports and imports, whereas official statistics of the U.S. Department of Commerce were used for U.S. exports and imports reported elsewhere in this study.

Source: Compiled from United Nations Yearbook of International Statistics, Japan Economic Yearbook, United States Current Industrial Reports, MA35--Q, various years, United Kingdom statistics from CSO Annual Abstract of Statistics, 1982, and U.S. Department of State airgrams.

Product Description and Uses

The function of a bearing is to reduce friction between moving parts and thereby enable easier, faster motion. Bearings are high-precision products that operate in practically every industrial and military device. Production of bearings requires hours of turning, heat treatment, grinding, assembly, and inspection. A typical ball bearing requires more than 40 manufacturing operations. The diagram in appendix D illustrates the steps required to produce bearings by their major components (outer rings, inner rings, ball, and retainers) through the various manufacturing processes and the matching stage that results in final assembly.

Bearings may be classified into two broad categories: ball bearings and roller bearings. The principal differences between the categories are the rolling elements (balls or rollers) and their respective abilities to carry loads (see appendix E for illustrations of the various types of ball and roller bearings). Ball bearings, having less contact between the rolling balls and the case, can withstand fairly high speeds. When load-carrying capacity is considered more important than high speeds, roller bearings are more likely to be used.

Ball and roller bearings are generally not interchangeable, but the original determination of which type to use is sometimes a matter of choice depending on the characteristics mentioned above and other engineering factors specific to a product. As an example, the move toward production of smaller, lighter weight front-wheel drive automobiles in the United States has resulted

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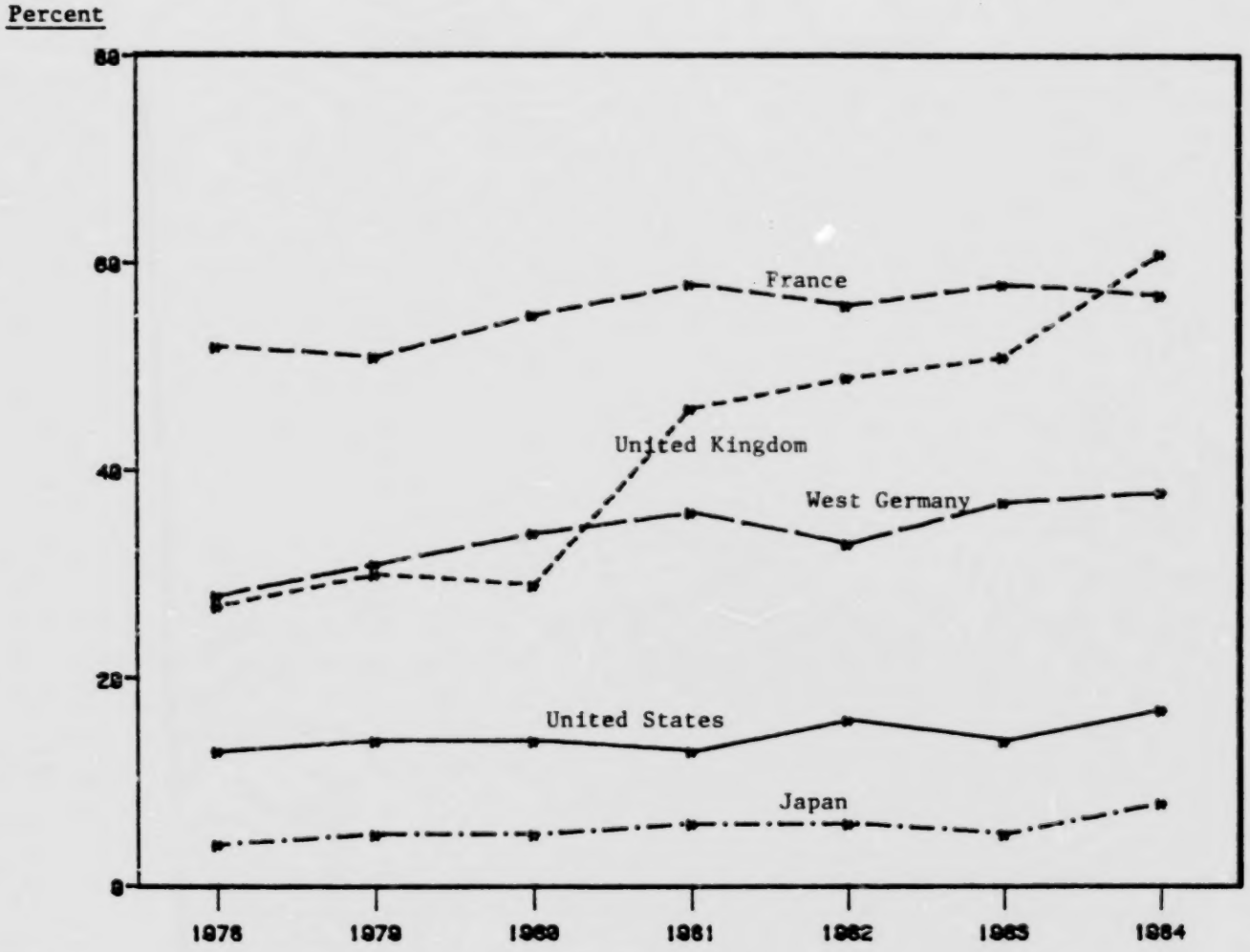
Figure 4.--Percent of import penetration in major bearing producing nations, 1978-84.



Source: Data compiled from United Nations Yearbook of International Statistics, Japan Economic Yearbook, CSO Annual Abstract of Statistics, 1982, U.S. Department of State Airgrams, and official statistics of the U.S. Department of Commerce.

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in the use of double-row ball bearings in these vehicles; in the past, tapered roller bearings had been the traditional choice. 1/

Ball bearings

Ball bearings may be radial (a bearing designed to support load perpendicular to shaft axis) or thrust (a bearing designed to support load parallel to shaft axis), or contain integral shafts (a combination of radial and thrust loads). They also may be classified by a number of configurations, including single row, double row, self aligning, and angular contact. Load, speed, required bearing life, environment, and lubricants are the most important variables to consider in choosing the proper bearing for a given application. 2/ The wide variety of applications for ball bearings include automotive products, farm implements, materials-handling equipment, motors, pumps, compressors, various home appliances, and aircraft engines.

Roller bearings

Roller bearings can support greater loads than ball bearings because they have a greater rolling surface area in contact with the inner and outer race (the outer ring and inner ring of a bearing). The most common types of roller bearings are cylindrical, spherical, needle, and tapered.

Cylindrical roller bearings

Cylindrical roller bearings have cylindrical rollers that are in linear contact with the raceway. Such bearings have a large radial load capacity and, because of their structure, are suitable for handling heavy loads and high speeds. Cylindrical roller bearings are most commonly used in metal rolling mills.

Spherical roller bearings

Spherical roller bearings are so called because spherical rollers are placed between the inner and outer rings. This bearing withstands radial loads as well as thrust loads applied in either direction. The greatest advantage of a spherical roller bearing is its ability to correct misalignment, without reducing the life of the bearing. Because this type of bearing is capable of resisting heavy and shock loads, it is widely used in industrial machinery (i.e., deep-well pump motors, dredge pumps, extruders, grinding and crushing equipment, paper mills, printing presses, metal rolling mills, and heavy construction machinery).

1/ "Availability is the key for the 1980's," Purchasing, Feb. 10, 1983, p. 60.

2/ "Bearings," 1985 Power Transmission Design Handbook, p. A/158.

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Needle roller bearings

Needle roller bearings are a special type of cylindrical bearing, distinguished by a comparatively small diameter and a high ratio of length to diameter. Needle bearings are used especially in universal joints, textile machinery, aircraft control mechanisms, household appliances, and machine tools.

Tapered roller bearings

Tapered roller bearings consist of a cup (outer race) and a cone assembly (inner race, rollers, and a cage). They are widely used, with some of their principal applications being in automotive equipment, farm and industrial machinery, construction equipment, mobile homes, conveyors, railroad equipment, and recreational vehicles (see appendix E for illustrations of bearing types and component parts).

Mounted bearings

Mounted bearing units offer convenience and economy since the amount of time spent selecting and preparing bearing elements, housings, and seals as well as the methods of securing bearings to shafts is reduced.

Ball and roller bearings are manufactured to generally strict standards for dimensions and tolerances, established by the Annular Bearing Engineers Committee (ABEC) of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA). The committee maintains universal standards for dimensions and tolerances of ball and roller bearings. Representatives from bearing manufacturing companies, both foreign and domestic, participate in the regular meetings of these standards-control groups. Both domestic and foreign companies manufacture bearings to ABEC standards for the U S. market. Standards approved by ABEC are sent to the American National Standards Institute, formerly the USA Standards Institute.

Tariff Treatment

U.S. tariff treatment

The following tabulation compares 1985 U.S. rates of duty with major competitor-country rates of duty.

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Product description	United States	Canada	European Community	Japan
Balls, rollers, or needle bearings and parts.	9.2% ad val. 1/	10.7% ad val.	9% ad val.	6% ad val.
Antifriction ball and rollers.	5.5% ad val.	10.7 ad val.	9% ad val.	6% ad val.
Ball bearings with integral shafts.	4.7% ad val.	10.7% ad val.	9% ad val.	6% ad val.
Other ball bearings and parts thereof.	11% ad val.	10.7% ad val.	9% ad val.	6% ad val.
Other roller bearings and parts thereof.	8.1% ad val.	10.7% ad val.	9% ad val.	6% ad val.
Bearing housings 2/	6.7% ad val.	9.1% ad val.	7% ad val.	4.2% ad val.

1/ Ad valorem equivalent estimated by the staff of the U.S. International Trade Commission.

2/ Bearing housings are provided for in the TSUS under 2 separate provisions: ball and roller bearings type pillow blocks and parts thereof (TSUS item 681.10); and ball and roller bearing-type flange, take-up, cartridge, and hanger units, and parts thereof (TSUS item 681.10). Both provisions have identical rates of duty.

More detailed descriptions of both U.S. and foreign tariff rates are included later.

Antifriction ball and roller bearings are classified in several items of the Tariff Schedules of the United States (TSUS), as summarized in the following tabulation:

Commodity	TSUS item No.
Antifriction balls and rollers	680.30
If Canadian article and original motor-vehicle equipment	680.31
Ball or roller bearings with integral shafts, and parts thereof	680.33,-.37,-.39
If Canadian article and original motor-vehicle equipment	680.34,-.38,-.41
Mounted ball and roller bearings, and parts thereof	681.04,-.10

Excerpts from the TSUS (1985) that pertain to antifriction ball and roller bearings are provided in appendix F.

The column 1 rates of duty shown in appendix F for mounted and unmounted ball and roller bearings, and parts thereof, were reduced as a result of the Tokyo round of the Multilateral Trade Negotiations (MTN). 1/ Table 4 provides

1/ See explanation in app. F.

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the staged reductions in the rates of duty as a result of the MTN. All of the enumerated tariff items reflect a special "free" rate of duty for products of Israel and designated Caribbean Basin Economic Recovery Act beneficiaries, except TSUS item 680.37 (Israel rate of 8.8 percent ad valorem).

Table 4.--Ball and roller bearings and parts thereof: U.S. rates of duty, present and negotiated, by TSUS items

TSUS item No.	Description	Present col. 1 rate of duty 1/	Negotiated col. 1 rate of duty 2/	Col. 2 rate of duty 3/	GSP eligibility
680.30	Antifriction balls and rollers.	5.5% ad val.	4.9% ad val.	45% ad val.	No.
680.31	If Canadian article- and original motor-vehicle equipment.	Free 4/			
	Ball or roller bearings including such bearings with integral shafts, and parts thereof:				
680.33	Ball bearings with integral shafts.	4.7% ad val.	4.2% ad val.	35% ad val.	No.
680.34	If Canadian article and original motor-vehicle equipment.	Free 4/			
680.37	Other ball bearings and parts thereof.	11% ad val.	5/	67% ad val.	No.
680.38	If Canadian article and original motor-vehicle equipment.	Free 4/			
680.39	Other bearing and parts thereof.	8.1% ad val.	6.5% ad val.	67% ad val.	No.
680.41	If Canadian article and original motor-vehicle equipment.	Free 4/			
681.04	Ball or roller bearing type pillow blocks.	6.7% ad val.	5.7% ad val.	45% ad val.	No.

See footnotes at end of table.

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Table 4.--Ball and roller bearings and parts thereof: U.S. rates of duty, present and negotiated, by TSUS items--Continued

TSUS item No.	Description	Present col. 1 rate of duty 1/	Negotiated col. 1 rate of duty 2/	Col. 2 rate of duty 3/	GSP eligibility
	Flange, take-up, cartridge, and hanger units, and parts thereof:				
681.10	Ball and roller bearing type.	6.7% ad val.	5.7% ad val.	45% ad val.	No.

1/ Rates in effect as of Jan. 1, 1985. The rates of duty in col. 1 are most-favored-nation (MFN) rates, and are applicable to imported products from all countries except those Communist countries and areas enumerated in general headnote 3(d) of the TSUS. However, MFN rates do not apply if preferential tariff treatment is sought and granted to products of developing countries under the Generalized System of Preferences (GSP) or the Caribbean Basin Economic Recovery Act (CBERA), or to products of Israel or of least developed developing countries (LDDC's), as provided under the special rates of duty column.

2/ Final rate negotiated under the Tokyo round of the Multilateral Trade Negotiations to be achieved through 8 annual staged duty reductions, the last one to be effective Jan. 1, 1987. These rates are currently afforded to imports from least developed, developing countries.

3/ The rates of duty in col. 2 apply to imported products from those Communist countries and areas enumerated in general headnote 3(d) of the TSUS.

4/ Effective as of Jan. 18, 1965.

5/ Duty reduction was not negotiated.

Imports of products covered in this report have been the subject of several trade complaints since 1972. In July 1973, the Commission completed investigation No. TEA-I-27, Antifriction Balls and Ball Bearings, Including Ball Bearings with Integral Shafts, and Parts Thereof, under section 301(b)(1) of the Trade Expansion Act of 1962. The Commission unanimously determined that ball bearings, including such bearings with integral shafts (except radial ball bearings having an outside diameter of under 9 millimeters) were, as a result in major part of concession granted under trade agreement, being imported in such increased quantities as to cause serious injury to the domestic industry. The Commission made a negative determination by a vote of 3-1 with respect to antifriction balls and certain other ball bearings. The Commission recommended that the President increase the rate of duty on the articles that were the subject of the Commission's affirmative determination. On March 29, 1974, the President increased the duty rates on radial ball bearings classified under TSUS item 680.35 (expanded to 680.30, 680.33, 680.37, and 680.39), effective May 1, 1974, and subsequently provided for rate reductions on May 1, 1976, and May 1, 1977, as indicated in appendix G. Firms in the industry producing radial ball bearings were also authorized to file petitions with the Secretary of Commerce for certification of eligibility to apply for adjustment assistance under chapter 2 of title III of the Trade

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Expansion Act of 1962. Industry workers were similarly authorized to petition the Secretary of Labor for certification of eligibility to apply for adjustment assistance under chapter 3 of title III of the Trade Expansion Act of 1962.

In January 1975, the Commission instituted investigation No. AA1921-143, Tapered Roller Bearings and Certain Components Thereof from Japan, under the Antidumping Act, 1921. The Commission determined by a vote of 4 to 2 that an industry in the United States was likely to be injured by reason of the importation from Japan of tapered roller bearings sold in the United States at less than fair value. An antidumping order was issued and it remains in effect.

In March 1983, the Commission conducted preliminary investigations Nos. 731-TA-120, 121, and 122, Certain Tapered Roller Bearings and Parts Thereof From Japan, the Federal Republic of Germany, and Italy (Preliminary), under section 733(a) of the Tariff Act of 1930. The Commission determined by a vote of 1 to 1 that there was a reasonable indication of material injury to the U.S. industry and so notified the U.S. Department of Commerce. On August 30, 1983, Commerce determined that imports from Japan and Italy (but not from West Germany) were being sold to the United States at less than fair value (LTFV). Accordingly, in February 1984, the Commission instituted final antidumping investigations under section 735 of the Tariff Act of 1930, on certain tapered roller bearings and parts thereof from Japan (investigation No. 731-TA-120 (Final)) and Italy (investigation No. 731-TA-122 (Final)). The bearings that were the subject of these investigations were assembled tapered journal roller bearings (and parts thereof) with assembled outside diameters between 6.5 inches and 10.875 inches. The Commission made negative determinations by votes of 4 to 0 in both cases, and therefore, no antidumping duty order was issued.

Foreign tariff treatment

The Customs Cooperation Council Nomenclature (CCCN) is used as the basis for tariff classification by most countries, except for the classifications used by the United States and Canada. Under the CCCN, ball and roller bearings and parts thereof, including balls and rollers, are classified under heading 84.62. Bearing housings incorporating ball, roller, or needle roller bearings are classified under heading 84.63.

Imports into Canada are classified in their tariff schedule under item 42723-1, ball and roller bearings for the repair of agricultural implements and agricultural machinery, and parts thereof; under item 42726-1, ball and roller bearings of a class or kind not made in Canada, not otherwise provided for (n.o.p.), and parts thereof; under item 42729-1, ball and roller bearings, n.o.p., and parts thereof; under item 42730-1, steel cages for use in the manufacture of tapered roller bearings; under item 43806-1, bearing housings of a class not made in Canada, n.o.p.; and under item 4387-1, bearing housings of a class or kind made in Canada, n.o.p.

Selected rates of duty, present and negotiated, for ball and roller bearings and parts in Canada, the European Community (EC), and Japan appear in table 5.

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Table 5.--Ball and roller bearings and parts thereof: Selected rates of duty, present and negotiated, in principal foreign markets for U.S. exports

Country	Description of commodity and foreign tariff item No.	Present rate of duty 1/	Negotiated rate of duty 2/
Canada	Ball and roller bearings for repair of agricultural implements and agricultural machinery; parts thereof (42723-1).	Free	
	Ball and roller bearings of a class or kind not made in Canada, n.o.p., parts thereof (42726-1).	Free	
	Ball and roller bearings, n.o.p., parts thereof (42729-1).	10.7% ad val.	9.2% ad val.
	Steel cages for use in the manufacture of tapered roller bearings (42730-1).	Free	
	Bearing housings of a class not made in Canada, n.o.p., (43806-1).	Free	
	Bearing housings of a class or kind made in Canada, n.o.p., (43807-1).	9.1% ad val.	8.0% ad val.
EC	Ball, roller or needle roller bearings (84.62).	9% ad val.	3/
	Bearing housings whether or not incorporating ball, roller, or needle roller bearings (84.63).	7% ad val.	3/
Japan	Ball, roller, or needle roller bearings; parts (84.62).	6% ad val. 4/	6.6% ad val.
	Bearing housings (84.63)	6% ad val.	3/

1/ Current duty rates, effective Jan. 1, 1985, applicable to imports from the United States.

2/ Final rate negotiated under the Tokyo round of the Multilateral Trade Negotiations to be achieved through 8 annual staged duty reductions, the last one to be effective Jan. 1, 1987.

3/ A duty reduction was not negotiated under the MTN.

4/ Temporary duty rate.

The European Community Commission has conducted several investigations concerning dumping by Japanese ball and roller bearing manufacturers. In February 1977, Commission Regulation (EC) No. 261/77, imposed a provisional antidumping duty on ball bearings, tapered roller bearings, and parts thereof originating from Japan. This regulation called for a provisional antidumping

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duty of 20 percent on several bearings by most suppliers within the Common Customs Tariff (heading Nos. ex 84.62, ball bearings; 84.62-11, tapered roller bearings; 84.62-17, parts of ball bearings; 82.62-29 and ex 84.62-33, parts of tapered roller bearings; 84.62-27 and ex 84.62-33). Duties for products exported by Nachi-Fujikoshi Corp., and Koyo-Seiko Co., Ltd., both of Japan, were set at 10 percent. 1/ On May 3, 1977, under Council Regulation (EC) No. 944/77, the Commission extended the provisional antidumping duty on ball bearings, tapered roller bearings, and parts thereof, and originating from Japan for no longer than 3 months. Finally, in August 1977, Council Regulation (EC) No. 1778/77 imposed a definitive antidumping duty of 15 percent on ball bearings (84.62-11), and tapered roller bearings (84.62-17), originating from Japan. 2/

In September 1979, the European Community Commission instituted an investigation on ball bearings and tapered roller bearings from Japan, Poland, Romania, and the U.S.S.R. In Commission Decision 81/406 (EC) of June 4, 1981, the Commission found that as a result of the dumping of imports, EC bearing manufacturers were injured. At that time, no duties were imposed. 3/ However, in December 1984, (in response to the reopening of decision 81/406) Commission Regulation (EC) No. 3669/84 set the following rates of antidumping duties for manufacturers as well as exporters (percent ad valorem): 4/

	Ball bearings	Tapered roller bearings
Koyo Seiko Co., Ltd	6.88%	5.79%
Nachi-Fujikoshi Corp	19.00%	31.34%
Nippon Seiko KK (NSK)	16.26%	23.60%
NTN Toyo Bearing Co., Ltd	2.01%	2.16%

On June 24, 1985, under Council Regulation (EEC) No. 1739/85 the following definitive duties were imposed (percent ad valorem):

	Ball bearings	Tapered roller bearings
NTN Toyo Bearing, Ltd., Osaka	3.00%	2.09%
Koyo Seiko Co., Ltd., Osaka	5.52%	4.39%
Nippon Seiko KK Tokyo (NSK)	16.71%	45.04%
Nachi Fujikoshi Corp., Tokyo (Nachi)	13.91%	22.72%
FKC Bearing Co., Ltd., Osaka	1.21%	1/
Fujino Iron Works Co., Ltd., Osaka	7.97%	1/
Izumoto Seiko Co., Ltd., Osaka	21.75%	1/
Nankai Seiko Co., Ltd., Osaka	4.23%	1/
Sapporo Precision Inc., Sapporo	1.86%	1/
Wada Seiko Co., Ltd., Osaka	10.73%	1/

1/ There were no exports of this product.

1/ Official Journal of the European Communities, No. L 34, Feb. 5, 1977, p. 60.

2/ Official Journal of the European Communities, No. L 196, Aug. 3, 1977, p. 1.

3/ Timken prehearing brief, p. 52.

4/ Official Journal of the European Communities, No. L 340, Dec. 28, 1984, p. 41.

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Profile of the U.S. Industry

U.S. producers

There are 83 firms, operating a total of 140 manufacturing establishments, that produce ball and roller bearing in the United States. Of these, four major producers account for 56 percent of the value of industry shipments. Smaller "specialty" bearing producers, and firms producing for their own consumption, account for the remainder of U.S. production.

Most manufacturers produce either ball or roller bearings, though approximately 15 firms produce both. The General Motors Corp.; SKF Industries, Inc.; and Federal Mogul Corp. manufacture ball and roller bearings. The Timken Co. and the Torrington Co. specialize in roller bearings, and Fafnir Bearing manufactures only ball bearings.

According to industry sources, the large firms that compete across a broad range of product lines have been more affected by imports than the small firms, which have tended to compete in highly specialized markets. Import penetration has been less pronounced in these specialty markets. The larger firms have historically derived a relatively high percentage of total revenues from sales of low-cost, mass-produced bearings. Import penetration has been greater in these markets. Industry sources indicate that economies of scale in production and price competitiveness are more significant factors in overall competitiveness in low-value-added bearing markets than compared with "specialty" markets. Success in specialty markets tends to require investment in servicing capability. Many end users of such bearings are willing to pay higher prices for reliable engineering support to service bearings in use. This has worked to the advantage of U.S. firms that have such capability and to the disadvantage of foreign firms, which often do not have such capabilities.

Questionnaire data reveal that investment has fallen significantly in the U.S. ball and roller bearings industry but capacity has remained relatively stable. Despite capacity reductions in some product lines, on balance, the U.S. bearings industry has not experienced, as yet, the significant reductions in capacity that frequently accompany an industry's adjustment to international competition. The maintenance of production capacity, despite falling employment, exports, and investment, may be explained by three factors:

(1) The industry has developed its most serious competitiveness problems during the last four years, a period in which the strong dollar has posed serious problems for many U.S. industries. The potential beneficial effect of the widely predicted fall in the dollar's value over the next few years may have convinced many firms to maintain capacity, at least until the effects of a fall in the dollar's value are clear.

(2) Foreign investors appear to have increased purchases of U.S. bearing facilities. It is possible that these investors, convinced that they can manage U.S. bearing operations more profitably than their former owners, have maintained capacity that might otherwise have been streamlined or retired.

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(3) Competitive factors such as the desirability of offering a complete line of bearings to existing and potential customers, and the need to be prepared to meet increased demand quickly, may have convinced many firms to retain underutilized capacity.

The maintenance of capacity, however, may pose potential problems for current and future competitiveness. Investment has not only fallen considerably but must be used, at least to some degree, to maintain assets generating low rates of return. Costs imposed by the maintenance of capacity in lines of bearings that are increasingly uncompetitive in U.S. and world markets, impede efforts of firms seeking to upgrade facilities that produce lines of bearings that are competitive. Uncertainty over the future course of competitiveness in low-value-added bearing markets could therefore have a significant impact on the ability of U.S. producers to compete in the so-called higher end of the market. Even if the value of the dollar falls, as many economists expect, several years of minimal investment may diminish the competitiveness of U.S. producers.

According to questionnaire data and industry sources, the condition of U.S. ball and roller bearing producers is currently characterized by the following features:

1. Higher capital costs than 5 years ago;
2. Falling overall capital investment, but increasing investment in new manufacturing technologies;
3. Uncertainty over the effects of a potential fall in the dollar's value;
4. Intense price competition in major markets;
5. A relatively old capital stock, difficult to sell on open markets;
6. Overcapacity; and
7. Moderate decline in profits over the past few years.

U.S. producers are in a process of restructuring domestic operations to adjust to import competition and worldwide overcapacity in the bearings industry. Few U.S. manufacturers appear willing to invest heavily in facilities in the United States to challenge importers at the lowest end of the bearing market (mass-produced, high-volume bearings). Although the expected decline in the value of the dollar will probably provide some relief, industry sources indicate that the threat of another wave of import competition from Eastern Europe and the People's Republic of China in the next 10 years, and the relatively poor condition of the domestic capital stock for low-cost bearings, have discouraged U.S. manufacturers from investing heavily in low-cost lines of bearings. The deterioration of the financial position of U.S. producers from 1980 to 1983 (which also raised the cost of financing charges to them) and high real interest rates have tended to discourage investment, although improved industry profitability in 1984 was apparent, and may ease this situation somewhat.

The strong dollar has further complicated the investment decisions of U.S. producers. If the dollar falls significantly, demand for imported bearings may fall which would benefit purchases from domestic sources,

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enabling firms that retained capacity to profit. If, however, the current level of import penetration in high-unit-volume bearings continues, U.S. firms that shed such unprofitable operations may gain an advantage over U.S. firms that did not. Firms that decide to stay in the market despite strong import competition have an incentive to cut prices as a means of sustaining market share awaiting market improvements. Importers of foreign bearings, anxious to retain market share and able to translate dollar profits into their domestic currencies at favorable exchange rates, have also reduced prices (see table 6). The rigorous price competition that has resulted has lowered profitability in the domestic industry, according to some industry sources. In response to import pressure, U.S. producers, on balance, have cut prices enough to limit loss of market share to imports, but not enough to prevent some minor loss of market share--by 4 percentage points in 6 years.

Price data compiled in response to Commission questionnaires suggest that, on balance, the U.S. produced bearings were higher priced than comparable imports in 1980, and still are in 1985. The price competition has forced the industry to reduce the labor force and to attempt to modernize production facilities. This explains rising R&D expenditures despite lower overall capital expenditures. Nevertheless, industry sources indicate that the attempt by U.S. producers to meet import competition has been complicated by low profit margins and high real interest rates. Currently, U.S. producers are generally less able to finance modernization through retained earnings and must turn to capital markets with high interest rates.

The age of the U.S. producers' capital stock also has implications concerning the ability of some producers to finance new investments. According to industry sources, the sale of capital stock to finance either new equipment or to retool used equipment to the manufacture of a different line of bearings is difficult (see table 17). U.S. producers' capital stock tends to be old and fully depreciated and worth little on the open market, so that sale of old capital stock to finance investment in production facilities for a different line of bearings is difficult. Despite such difficulties, however, U.S. producers appear to have limited import penetration, but only at the cost of reduced capital investment and lower profits. It should be noted, however, that other factors such as the 1981-82 recession and overcapacity in the bearing industry, domestically and worldwide, may have also contributed to lower investment. Available data and interviews with corporate officials suggest that U.S. producers have adopted the following strategies:

1. Import more complete ball bearings;
2. Import more components for roller bearings;
3. Increase investment in new manufacturing technologies;
4. Aggressively meet foreign competition in markets in which U.S. firms might have a long-term competitive advantage when the dollar falls. (This involves below average cost pricing in some circumstances); or
5. Gradually diversify out of high-volume bearings to more profitable "specialized" bearings or other industries.

Table 6 below compares U.S. producers' prices with importers' prices in select bearings markets for 1980 and January-June 1985. Table 7 summarizes the data in table 6 to indicate the price competitiveness of U.S. producers in select bearings markets.

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Table 6.--Ball and roller bearings: U.S. producers' and importers' prices 1/ 2/ in the original-equipment market (OEM) and wholesaler/ distributor market, by types, 1980, and January-June 1985 3/

Item	1980	Jan.-June 1985	Percentage change, 1985 from 1980
	Original-equipment manufacturers		
Radial bearings 9mm-30mm:			
U.S. producers	$0.45	$0.53	17.8
Importers	.74	.53	-28.4
Radial bearings 30mm-51mm:			
U.S. producers	.99	.68	-31.3
Importers	.85	.57	-33.0
Radial bearings 52mm-100mm:			
U.S. producers	1.79	1.58	-11.7
Importers	1.71	2.22	29.8
Cups for tapered roller bearings under 4.5 inches cup OD:			
U.S. producers	.44	.41	-6.8
Importers	.20	.14	-30.0
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches:			
U.S. producers	.92	.86	-6.5
Importers	1.07	.40	-62.6
Needle roller bearings:			
U.S. producers	.96	1.07	11.5
Importers	4/	4/	4/
	Wholesaler/distributor		
Radial bearings 9mm-30mm:			
U.S. producers	$1.92	$1.93	0.5
Importers	0.90	0.62	-31.1
Radial bearings 30mm-52mm:			
U.S. producers	1.63	1.00	-38.7
Importers	.80	1.06	32.5
Radial bearings 52mm-100mm:			
U.S. producers	2.77	1.63	-41.2
Importers	2.16	1.37	-36.6
Cups for tapered roller bearings under 4.5 inches cup OD:			
U.S. producers	.71	.71	4/
Importers	4/	.31	4/
Cone and roller assemblies for tapered roller:			
U.S. producers	1.38	4/	4/
Importers	4/	.75	4/

See footnotes at end of table.

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Table 6.--Ball and roller bearings: U.S. producers' and importers' prices 1/ 2/ in the original-equipment market (OEM) and wholesaler/ distributor market, by types, 1980, and January-June 1985 3/--Continued

Item	1980	Jan.-June 1985	Percentage change, 1985 from 1980
	Wholesaler/distributor--Continued		
Needle roller bearings:			
U.S. producers	$1.58	$1.85	17.1
Importers	4/	.73	4/

1/ In constant 1980 dollars.

2/ Based on a sample of select firms' 3 largest sales.

3/ Product categories contain a range of types of bearings and some price variation between 1980 and 1985 may be due to differences in types of bearings sold in the 2 years compared.

4/ Not available.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 7.--Ball and roller bearings: Competitive position in terms of price of U.S. producers vis-a-vis importers, by types of bearings, in the OEM and wholesaler markets, 1980, and January-June 1985

Item	1980		
	Advantage	Disadvantage	Even
	Original-equipment manufacturer		
Radial bearings:			
9mm-30mm	X		
30mm-55mm		X	
52mm-100mm		X	
Cups for tapered rollers bearings under 4.5 inches cup OD		X	
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	X		
Needle roller bearings	1/	1/	1/
	Wholesaler/distributor		
Radial bearings:			
9mm-30mm		X	
30mm-55mm		X	
52mm-100mm		X	
Cups for tapered roller bearings under 4.5 inches	1/	1/	1/
Cone and roller assemblies for tapered roller bearings	1/	1/	1/
Needle roller bearings	1/	1/	1/
	January-June 1985		
	Advantage	Disadvantage	Even
	Original-equipment manufacturer		
Radial bearings:			
9mm-30mm			X
30mm-55mm		X	
52mm-100mm	X		
Cups for tapered roller bearings under 4.5 inches cup OD		X	
Cone and roller assemblies for tapered roller bearings		X	
Needle roller bearings	1/	1/	1/

1/ Not available.

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Table 7.--Ball and roller bearings: Competitive position in terms of price of U.S. producers vis-a-vis importers, by types of bearings, in the OEM and wholesaler markets, 1980, and January-June 1985--Continued

Item	January-June 1985		
	Advantage	Disadvantage	Even
	Wholesaler/distributor		
Radial bearings:			
9mm-30mm		X	
30mm-55mm	X		
52mm-100mm		X	
Cups for tapered roller bearings under 4.5 inches cup OD		X	
Cone and roller assemblies for tapered roller bearings		X	
Needle roller bearings		X	

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Despite the falling investment, exports, and profits, U.S. producers appear to have met import competition in domestic markets with relative success. Import figures reveal that the value of U.S. imports of ball and roller bearings as a percentage of total apparent U.S. consumption has increased only marginally from 1980 to 1984. 1/ Commerce data show that the value of U.S. imports of ball and roller bearings as a percentage of total apparent consumption rose from 14.5 percent in 1980 to 16.0 percent in 1984. Further, in 1981 and 1983, the import-to-consumption ratio fell below 14.5 percent to 13.1 percent in 1981 and 13.5 percent in 1983. Only imports of tapered roller bearings and parts have shown a large increase. The value of imports of tapered roller bearings and parts increased from 8 percent of apparent U.S. consumption in 1980 to 17.5 percent in 1984. In addition, questionnaire data reveal that U.S. producers' capacity for cups for tapered roller bearings fell 29 percent, and declined 26 percent for cone and roller assemblies for tapered roller bearings. In absolute terms, the value of U.S. imports of tapered roller bearings and parts increased from $66 million in 1980 to $158 million in 1984.

On balance, however, the competitiveness of U.S. producers in the domestic market has not seriously deteriorated in the 1980's, although the strain of vigorous price competition from 1980 to 1985 may erode the competitive condition of U.S. producers in the late 1980's. The following factors may affect the industry:

1/ Imports of low priced bearings have, however, increased significantly.

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1. Exports have fallen and imports have risen, so that efficiency of capacity utilization in production may decline relative to that of foreign competitors;
2. Capital investment has fallen; and
3. Foreign competitors have invested in U.S. production, servicing and marketing facilities, potentially making it easier for them to gain military contracts, and to penetrate markets that require extensive servicing networks.

According to calculations derived from official statistics of the U.S. Department of Commerce, imports as a percentage of apparent U.S. consumption, rose to 16 percent in 1984. Although the increase in imports as a percent of consumption during 1980-84 is not large, it could rise further in 1985 based on the 18-percent increase in imports during January-June 1985, compared with January-June 1984. It is difficult to predict what effect the fall in the U.S. dollar's value in 1985 will have on the recent upward trend in imports.

Foreign investment in the United States

Foreign direct investment in the U.S. ball and roller bearing industry is concentrated in ball bearing rather than in roller bearing production facilities. Domestic production of complete ball bearings by firms owned by non-U.S. parents increased from 99.4 million units in 1980 to 126.5 million units in 1984. 1/ As a percent of total U.S. production, the output of complete ball bearings by foreign-owned firms increased from 28.2 percent in 1980 to 36.8 percent in 1984. New acquisitions by Japanese firms and increased production by Japanese-owned firms in the United States account for most of this increase.

With respect to production of roller bearings, foreign-owned domestic firms increased their share of U.S. production of cone and roller assemblies for tapered roller bearings from 13.8 percent in 1980 to 24.2 percent in 1984. Foreign investment in U.S. production facilities manufacturing other forms of roller bearings and in mounted bearing production has been less pronounced.

Capacity

Questionnaire data reveal that production capacity remained relatively stable from 1980 to 1985. Capacity utilization, on the other hand, decreased sharply in 1982, recovered slightly in 1983, and rose to rates approaching 1981 levels in 1984.

In 1980, capacity utilization for various kinds of bearings ranged between 61.1 percent for roller bearings and 77.1 percent for mounted bearings

1/ Production of U.S. firms that are partially-owned by foreign investors has been included to reflect the extent of foreign ownership. Such production is calculated proportional to the share of foreign ownership.

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(table 8). According to questionnaire data, the overall capacity utilization rate for 1980 was 69 percent. Commerce has estimated 1980 capacity utilization for the bearings industry at 75 percent.

Capacity utilization in 1981 ranged between 90.3 percent for tapered roller bearings and 65.4 percent for "other ball bearings." According to the questionnaire data, overall capacity utilization in 1981 was 73.1 percent compared with 62 percent estimated by Commerce.

Capacity utilization in 1982 fell sharply, ranging from 41.5 percent for production of "other roller bearings" to 64.2 percent for production of mounted ball bearings. According to the questionnaire data, overall capacity utilization in 1982 was 55.2 percent. Commerce has estimated that capacity utilization was 45 percent in the industry in 1982. In 1983, capacity utilization increased for almost all kinds of bearings included in the survey, except for spherical bearings. Capacity utilization in the production of spherical bearings decreased from 51.0 percent in 1982 to 40.0 percent in 1983. Otherwise, capacity utilization ranged from 40.0 percent for spherical bearings to 68.6 percent for mounted ball bearings production. According to survey data, overall capacity utilization was 63.7 percent in 1983; Commerce has estimated 1983 capacity utilization at 64 percent.

In 1984, capacity utilization rose for all types of bearings included in the survey. The overall capacity utilization rate rose from 63.7 percent in 1983 to 73.7 percent in 1984, according to questionnaire data. Rates ranged from 40.5 percent for "other roller bearings" to 73.7 percent for the production of ball bearings. Production and capacity utilization during January-June 1985 lagged slightly behind that of the corresponding period of 1984. Spherical bearing production increased slightly, however, as did production of balls.

Exports

The value of U.S. exports of ball and roller bearings declined from $369 million in 1980 to $331 million in 1984, according to official Commerce statistics (table 9). The value of U.S. exports of complete ball bearings fell from $94 million in 1980 to $80 million in 1984, and the value of exports of complete roller bearings fell from $79 million in 1980 to $70 million in 1984. The value of U.S. exports of tapered roller bearings, cups, and cones fell from $152 million in 1980 to $134 million in 1984. Commerce figures cited in this section are in nominal terms and actually understate the decline in the real value of exports by approximately 15 percent by being adjusted for inflation.

In absolute terms, between 1980 and 1984, U.S. export sales to Mexico and France declined most significantly (out of the top 10 export markets). The value of U.S. exports to Mexico declined from $52 million in 1980 to $39 million in 1984. In the same period, the value of U.S. exports to France fell from $24 million to $10 million. The decline in the value of U.S. exports to Mexico and France accounted for 71 percent of the total decline in the value of U.S. exports of ball and roller bearings from 1980 to 1984. The latest

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Table 8.--Balls, rollers, and ball and roller bearings: U.S. producers' production, capacity, and capacity utilization, by major types, 1980-84

Product and item	1980	1981	1982	1983	1984
Ball bearings, complete:					
Production-----1,000 units--	353,010	342,607	260,029	290,429	343,790
Capacity----------do----	476,685	479,645	467,645	447,547	482,316
Capacity utilization percent--	74.1	74.1	55.6	62.5	71.3
Cups for tapered roller bearings:					
Production-----1,000 units--	142,096	130,022	79,308	95,923	105,772
Capacity----------do----	208,392	143,956	148,210	154,159	149,252
Capacity utilization percent--	68.2	90.3	56.6	62.2	70.1
Cone and roller assemblies for tapered roller bearings:					
Production-----1,000 units--	140,523	128.970	76,763	89,231	108,378
Capacity----------do----	197,563	149,952	148,691	149,169	145,727
Capacity utilization percent--	70.1	86.0	59.0	59.0	71.4
Spherical roller bearings:					
Production-----1,000 units--	1,911	1,834	1,352	1,088	1,432
Capacity----------do----	2,537	2,701	2,611	2,668	2,709
Capacity utilization percent--	75.3	67.3	51.0	40.0	51.3
Other roller bearings:					
Production-----1,000 units--	18,136	18,441	11,720	12,136	13,655
Capacity----------do----	29,666	18,195	28,210	27,693	28,171
Capacity utilization percent--	61.1	65.4	41.5	43.0	40.5
Mounted ball bearings, except plain:					
Production-----1,000 units--	12,118	10,505	9,964	10,587	7,160
Capacity----------do----	15,725	15,017	15,553	15,441	12,309
Capacity utilization percent--	77.1	70.0	64.1	68.6	72.8
Balls:					
Production-----1,000 units--	6,676,508	7,165,402	5,228,221	6,212,869	7,059,664
Capacity----------do----	9,687,271	9,818,238	9,472,010	9,758,306	9,574,021
Capacity utilization percent--	69.0	73.1	55.2	63.7	73.7
Rollers:					
Production-----1,000 units--	5,759,691	6,280,258	4,586,094	5,461,424	6,168,406
Capacity----------do----	8,432,001	8,691,311	8,359,010	8,626,401	8,439,900
Capacity utilization percent--	68.3	73.3	54.8	63.3	73.3

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 9.--Ball and roller bearings: U.S. exports, by types of bearings, 1980-84, January-June 1984, and January-June 1985

(In millions of dollars)

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Ball bearings, complete	41,538	51,578	39,498	33,592	44,480	19,222	20,027
Tapered roller bearings	98,053	91,995	58,872	45,738	62,977	29,909	33,382
Other roller bearings	32,177	35,698	33,383	32,316	39,752	19,509	23,631
Mounted bearings	9,066	8,271	7,468	7,363	8,516	3,355	4,370
Components and parts of ball and roller bearings 1/	24,442	24,359	21,589	16,069	21,926	11,282	11,622
Total	205,276	211,901	160,810	135,078	177,651	83,277	93,032

1/ Compiled from official statistics of the U.S. Department of Commerce.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission, except as noted.

available figures indicate that the value of U.S. exports during January-September 1985 ($236 million) are slightly below the value of U.S. exports for the corresponding period of 1984 ($249 million).

Data obtained from Commission questionnaires show a similar decline in the value of exports from 1980 to 1984, but suggests an upward trend for 1985. Questionnaire data show that the value of exports of selected U.S. producers increased from $83 million during January-June 1984 to $93 million in the corresponding period of 1985. Questionnaire data also show a decline in the value of exports of firms surveyed from $205 million in 1980 to $178 million in 1984, or by 13 percent. Both Commerce and questionnaire data show a significant decline in the value of U.S. exports of tapered roller bearings. Although questionnaire data show a slight increase in the value of exports of complete ball and roller bearings, Commerce data show a decline.

Industry sources indicate that the decline in U.S. exports can be attributed to four factors:

1. The strong dollar;

2. Worldwide overcapacity in the bearings industry, which has driven down world prices to levels at which U.S. producers are often not competitive;

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3. Increased offshore manufacturing by U.S. bearing-consuming industries in countries that have indigenous bearings industries; and,

4. The depressed market demand for U.S. ball and roller bearings in such countries as Brazil, France, and Mexico, all major markets in recent years for U.S. exports.

Employment and wages

In 1984, the majority of U.S. establishments producing ball and roller bearings employed fewer than 1,000 workers. Department of Labor (DOL) data show that employment in the U.S. bearing industry has been declining steadily since 1966. Total employment in this industry declined from 57,900 workers in 1980 to 49,600 workers in 1984, or by 14 percent, and the production and related workers employment decreased by almost 18 percent during the same period. 1/

Respondents to the Commission's questionnaire reported an even sharper decreasing trend in employment, decreasing from 53,097 in 1980 to 43,242 in 1984, or by 19 percent (table 10). 2/ The number of production and related workers engaged in the manufacture of all products fell by 20 percent, from 45,601 workers in 1980 to 36,515 workers during 1984. During January-June 1985, respondents reported an average of 33,783 production workers compared with 34,006 during January-June 1984. Production workers engaged in manufacturing ball bearings, components, and parts accounted for 51 percent of total production workers in 1980 and 1984. Production workers manufacturing roller bearings, components, and parts represented 36 percent of all production workers in 1980 and 1984.

During 1980-84, employment in the ball and roller bearing industry was concentrated in the North Central region of the United States (Kentucky, Ohio, and Tennessee), which accounted for 26.2 percent of total employment on an average annual basis; and Connecticut, which accounted for 16.4 percent. Table 11 shows the average number of all persons employed in bearing establishments, by regions and by States during January 1980-June 1985.

Production and related workers engaged in the manufacture of bearings, components, and parts composed approximately 79.2 percent, on an average annual basis, of total employment in this industry, as reported by respondents to the Commission's questionnaires. Approximately 41 percent of production and related workers during 1980-84 were employed in the North Central region and 17.2 percent were employed in Connecticut (table 11). Statistics from the 1982 Census of Manufactures indicate that in 1982, Connecticut, South Carolina, and Indiana employed 36 percent of all workers and 34 percent of all production workers in the ball and roller bearing industry. Other major States employing workers included Pennsylvania, Ohio, New Hampshire, and New Jersey.

1/ Employment figures from "Employment and Earnings," U.S. Department of Labor.

2/ The Commission's producers' questionnaire was returned by 38 companies accounting for 85 percent of the domestic ball and roller bearings industry.

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Table 10.--Average number of employees in U.S. establishments producing ball and roller bearings and parts, 1980-84, January-June 1984, and January-June 1985

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Average number employed in the reporting establishment:							
All persons	53,097	51,653	42,377	37,855	43,242	40,449	40,465
Production and related workers engaged in the production of:							
All products 1/	45,601	44,438	35,367	31,721	36,515	34,006	33,783
Ball bearings, components, and parts	25,780	25,590	20,682	18,938	20,762	20,178	20,427
Roller bearings, components, and parts	16,529	15,871	12,535	10,894	13,265	11,572	10,701
Products, other bearings, components, and parts	3,292	2,995	2,150	1,885	2,488	2,292	2,655

1/ Figures do not add to the total for "all products" because employment for certain product data were not available from several respondents.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 11.--Ball and roller bearings: Total employment, by regions and States, 1980-84, January-June 1984, and January-June 1985

(Number of workers)

Region and State	1980	1981	1982	1983	1984	January-June	
						1984	1985
New England:							
Connecticut	10,995	10,575	7,993	6,759	7,076	6,941	6,516
Maine and New Hampshire	2,434	2,489	2,340	2,286	2,595	2,519	2,911
Mid-Atlantic: New Jersey, New York, and Pennsylvania.	7,494	7,309	7,728	7,143	7,522	5,975	5,637
South Atlantic: Georgia, North Carolina, South Carolina, and Virginia.	8,436	8,309	6,843	6,234	7,711	7,418	8,274
Central:							
Illinois, Indiana, and Michigan.	7,127	6,986	5,394	3,946	5,256	4,971	4,893
Kentucky, Ohio, and Tennessee.	14,806	14,073	10,272	9,728	11,036	10,742	10,233
Other: Alabama, Arkansas, California, Iowa, Kansas, Missouri, Oklahoma, and South Dakota.	1,805	1,912	1,807	1,760	2,046	1,883	2,001
Total	53,097	51,653	42,377	37,856	43,242	40,449	40,465

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

During 1980-84, the number of production and related workers in the bearing industry engaged solely in the production of bearings, bearing components, and parts decreased by 19.6 percent, or from 42,310 workers in 1980 to 34,028 workers in 1984, as shown in the table 12. The greatest losses in production and related workers occurred in 1982 when the number decreased by 8,225. Employment decreased in 1983 by 3,386 workers, but rose by 4,196 workers in 1984, partly because of growth in the market for automotive and defense products. Production and related workers employed during January-June 1984 totaled 31,714 workers, but fell to 31,128 workers during the corresponding period of 1985.

During 1980-84, Connecticut had the largest decrease (35.8 percent) in production and related workers, or a loss or 2,884 workers (table 12). Employment of such workers in Illinois, Indiana, and Michigan decreased by 28.2 percent, or 1,517 workers. Another 3,512 workers lost jobs in the industry in Kentucky, Ohio, and Tennessee, for a 26.4 percent decrease in employment, during the period and 882 workers lost jobs in Georgia, North Carolina, South Carolina, and Virginia, or a 12.6 percent decrease. Employment in the industry increased by a total of 432 workers in New Jersey, New York, and Pennsylvania. Although not shown separately in table 12 because

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Table 12.--Ball and roller bearings: Production employment, by regions and States, 1980-84, January-June 1984, and January-June 1985

(Number of workers)

Region and State	1980	1981	1982	1983	1984	January-June- 1984	January-June- 1985
New England:							
Connecticut	8,045	8,003	5,859	4,925	5,161	5,112	4,774
Maine and New Hampshire	1,990	1,990	1,820	1,763	1,921	1,853	2,037
Mid-Atlantic: New Jersey, New York, and Pennsylvania.	5,125	5,243	5,674	5,283	5,557	1/ 4,217	1/ 3,912
South Atlantic: Georgia, North Carolina, South Carolina, and Virginia.	7,011	6,811	5,568	4,928	6,129	5,927	6,368
Central:							
Illinois, Indiana, and Michigan.	5,380	5,263	3,920	3,074	3,863	3,536	3,490
Kentucky, Ohio, and Tennessee.	13,284	12,552	8,931	8,457	9,772	9,573	8,959
Other: Alabama, Arkansas, California, Iowa, Kansas, Missouri, Oklahoma, and South Dakota.	1,477	1,581	1,445	1,402	1,624	1,496	1,588
Total	42,312	41,443	33,217	29,832	34,028	31,714	31,128

1/ Reported employment is moderately understated because data were not available for several respondents.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

of confidentiality of the data, during 1980-84, employment grew most significantly in Tennessee and Georgia, and marginally in Alabama, Arkansas, California, Iowa, New Jersey, and North Carolina.

Employment shifts on a State basis are, according to industry sources, due primarily to depressed demand for bearings in specific industrial sectors, such as the oil drilling equipment industry, agricultural equipment, and, during the 1981-82 recession, the automotive industry. According to industry sources, many of the manufacturing plants, particularly those in New England, specifically Connecticut, are old manufacturing facilities. Rather than engaging in the costly rebuilding of facilities, some manufacturers moved operations to other areas because of economic (state tax structures and close promixity to end users) and wage incentives, including nonunionized labor. Others firms in the New England area have consolidated and restructured their operations by closing down inefficient plants. Regional employment shifts have been influenced, in part, by national trends in the industry and markets. These include increased foreign purchasing of certain bearings, bearing

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components, and parts by U.S. bearing producers; a shift of end users of bearings to either offshore procurement of bearings or offshore manufacture of products containing bearings, and, to a lesser extent, foreign acquisition of U.S. producers.

The ball and roller bearing industry requires a number of highly skilled, and trained workers to operate heat treating, metal cutting and forming, grinding, horning and assembly, and packaging machinery as well as instruments used to cut sizes and sustain quality control. According to the United Auto Workers (UAW) union there seems to be an abundance of skilled workers available because of the reductions in labor at bearing manufacturing plants.

According to data obtained from the Commission's questionnaires, 57 percent of U.S. ball and roller bearing plants are unionized. There are several companies with multiunion plants and a mixture of nonunion/union facilities. The most prevalent unions in the bearing industry are the UAW and the United Steelworkers Association.

In response to more intense offshore competition, U.S. bearing manufacturers have begun to consolidate and restructure their operations. The Timken Co. plans to consolidate production facilities and eliminate as many as 500 salaried employees through early retirement, attrition, and layoffs. 1/ Fafnir Bearing, a division of Textron, Inc., also has experienced a decline in employment. Fafnir employed 5,500 workers about 10 years ago, today it employs 3,800 workers. Mr. Brodsky, President of Fafnir, attributes the decline in employment to operating efficiencies as well as to increased imports of precision ball bearings. 2/ The Japanese Bearing Association believes technological displacement is the primary reason for this shrinkage in employment. 3/

Several bearing plants have applied for assistance under DOL's trade adjustment assistance program; 4/ but, more than one-half of the applications were turned down. 5/ Industry sources indicated that between 1982 and 1985, 19 ball and roller bearing plants, with a total of 2,649 workers, petitioned for assistance; however, only 7 plants, with a total of 290 workers, were accepted. 6/ DOL found that several plants lost workers to new plants in the South; therefore, the DOL determined that these plants were ineligible for assistance. The industry, however, feels that this was an unjust determination because bearing production in the North is greater than it was in 1979, and no employees from the North have moved to the South. 7/

Wages paid to ball and roller bearing industry workers increased from approximately $9.37 per hour in 1980 to about $10.83 per hour in 1982 and then to $11.66 per hour in 1984. 8/ Respondents to the Commission's survey

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1/ American Metals Market, Feb. 1, 1985, p. 2.
2/ Hearing transcript, Oct. 3, 1985, p. 141.
3/ Ibid., p. 212.
4/ The trade adjustment assistance program was designed to help workers who are unemployed as a result of foreign competition.
5/ Hearing transcript, Oct. 3, 1985, p. 41.
6/ UAW statement, Nov. 4, 1985.
7/ Hearing transcript, Oct. 3, 1985, p. 42.
8/ Information submitted in response to questionnaires of the U.S. International Trade Commission.

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reported hours worked by production and related workers declined from 83 million worker-hours in 1980 to 67 million worker-hours in 1984, or by 20 percent. Worker-hours for January-June 1984 were estimated at 32 million hours compared with 30 million during January-June 1985 (table 13). Wages paid to production workers for ball bearings and parts show a slight increase, from $404 million in 1980 to $438 million in 1984, representing an 8-percent increase. Wages paid to production workers for roller bearings and parts have declined 23 percent, from $323 million in 1980 to $249 million in 1984, as illustrated in table 13.

Table 13.--Average number of worker-hours worked and wages paid to U.S. production and related workers producing ball and roller bearings and parts, by major types, 1980-84, January-June 1984, and January-June 1985

Item	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
	Worker-hours (1,000 hours)						
Production and related workers engaged in the production of:							
All products 1/	82,757	78,839	58,722	55,934	66,674	31,826	30,387
Ball bearings and parts	45,762	45,748	35,029	33,771	38,666	19,381	19,228
Roller bearings and parts	30,196	27,538	19,627	17,976	22,842	10,048	8,458
Other products of establishments	6,799	5,553	4,024	4,075	5,015	2,342	2,614
	Wages (1,000 dollars)						
Total wages paid to production and related workers for:							
All products 1/	775,157	807,351	635,917	625,872	775,205	363,039	370,579
Ball bearings and parts	404,267	434,578	348,268	351,940	437,796	216,119	232,245
Roller bearings and parts	323,381	328,404	225,898	199,488	248,811	122,497	110,264
Other products of establishments	47,509	43,650	36,287	38,348	48,924	23,579	26,900

1/ Figures may not add to the total for "all products" because data for some product classes were not available from several respondents.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Financial experience of U.S. producers

A large sample of financial data for the overall ball and roller bearing industry was provided to the Commission by this industry for the periods between January 1980 and June 1985. With respect to data relating to the production of ball and roller bearings and parts, in 1980 and 1981, net sales rose from $3.0 billion to $3.4 billion, and net profits before income taxes as a percent of net sales, amounted to 7.1 percent and 7.2 percent, respectively. However, as net sales fell to $2.7 billion in 1982 and 1983, these profit ratios declined to 2.6 percent and 1.3 percent, respectively. In 1984 sales and profits rebounded to $3.3 billion and 5.1 percent, respectively. Sales were up during January-June 1985 compared with January-June 1984 ($1,613 billion versus $1,600 billion), but net profits as a percent of net sales were down to 3.3 percent compared with 6.1 percent.

During 1980-84, net profits before income taxes as a percent of net sales for U.S. operations relating to the production of ball and roller bearings and parts fell below such profits for all machinery, except electrical, as the following tabulation indicates (in percent):

	1980	1981	1982	1983	1984
Machinery, except electrical---------	8.0	10.1	6.7	6.8	8.7
Ball and roller bearings and parts---	7.1	7.2	2.6	1.3	5.1

Financial data from U.S. establishments within which ball and roller bearings, and parts were produced.--There were 38 producers of ball and roller bearings and parts that provided the Commission with financial data relative to their overall operations in establishments in which ball and roller bearings and parts were made.

Aggregate net sales for overall ball and roller bearings and parts operations rose from $3.2 billion in 1980 to $3.6 billion in 1981, declined to $2.9 billion in 1982 and $2.8 billion in 1983, then increased to $3.5 billion in 1984. Net sales during January-June 1985 and January-June 1984 were $1.7 billion.

Aggregate operating profits declined from $300 million in 1980 and 1981, $77 million in 1982, and $71 million in 1983, but then rose to $267 million in 1984. Operating profits were $101 million during January-June 1985 compared with $141 million during Janaury-June 1984. From January 1980 to June 1985, the ratio of operating profit to net sales ranged from a high of 9.4 percent in 1980 to a low of 2.5 percent in 1983. These and other financial data appear in table 14.

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Table 14.--Selected financial data from U.S. establishments within which ball and roller bearings, and parts were produced, 1980-84, January-June 1984, and January-June 1985

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Net sales							
million dollars--	3,176	3,561	2,853	2,839	3,471	1,700	1,702
Cost of goods sold--do----	2,550	2,852	2,367	2,375	2,772	1,345	1,374
Gross profit--------do----	621	709	486	464	704	355	325
General, selling, and administrative expenses-							
million dollars--	321	409	409	393	437	214	225
Operating profit or (loss)----------do----	300	300	77	71	267	141	101
Other income or (expense)							
million dollars--	(66)	(34)	(7)	(26)	(83)	(34)	(42)
Net profit or (loss) before income taxes							
millions dollars--	234	262	70	44	184	108	60
Depreciation and amortization expense							
million dollars--	111	131	144	154	151	74	80
Cash-flow (deficit) from operations							
million dollars--	345	393	213	199	335	182	140
As a share of net sales:							
Cost of goods sold							
percent--	80.3	80.1	83.0	83.7	79.9	79.1	80.7
General, selling, and administrative expenses							
million dollars--	10.1	11.5	14.3	13.8	12.6	12.6	13.2
Gross profit or (loss)							
million dollars--	19.6	19.9	17.0	16.3	20.3	20.9	19.1
Operating profit or (loss)							
million dollars--	9.4	8.4	2.7	2.5	7.7	8.3	5.9
Net profit or (loss) before income taxes							
percent--	7.4	7.4	2.5	1.5	5.3	6.4	3.5
Number of firms reporting operating loses---	3	4	15	8	6	5	7
Number of firms report- net losses----------	6	4	17	11	8	6	11

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Financial data from U.S. operations relating only to the production of ball and roller bearings and parts.--There were 38 producers of ball and roller bearings and parts, that provided the Commission with financial data relating to their production of ball and roller bearings and parts, accounting for 90 percent of U.S. producers' shipments of ball and roller bearings and parts in 1984. Financial data received from these firms appear below and in table 15.

Aggregate net sales of ball and roller bearings and parts rose from $3.0 billion in 1980 to $3.4 billion in 1981, declined to $2.7 billion in 1982 and 1983 before rising to $3.3 billion in 1984. Net sales during January-June 1985 were $1.613 billion compared with $1.600 billion during January-June 1984.

Aggregate operating profits relating to the production of ball and roller bearings and parts rose slightly from $278 million in 1980 to $283 million in 1981, then declined to $72 million in 1982 and $60 million in 1983, then rose to $248 million in 1984. Operating profits were $91 million during January-June 1985 compared with $131 million during January-June 1984. During January 1980-June 1985, the ratio of operating profit to net sales ranged from a high of 9.3 percent in 1980 to a low of 2.2 percent in 1983.

The following tabulation, compiled from data submitted in response to the Commission's questionnaire, shows the ratios of net profit before taxes to net sales for producers of three classes of sales of U.S. ball and roller bearings (in percent): 1/

Item	1980	1981	1982	1983	1984	January-June 1984	January-June 1985
Firms with sales of less than $30 million--	12.7	6.7	(1.9)	(2.4)	1.5	5.2	0.3
Firms with sales of $30 million to less than $100 million------	14.0	14.9	6.8	6.7	10.4	9.5	8.9
Firms with sales of $100 million or more---	5.1	5.8	2.3	0.7	4.5	5.6	2.4

These data indicate that the middle-sized firms experienced much of the highest rates of profits during January 1980-June 1985, whereas the smallest firms recorded the greatest fluctuation in such profit, ranging from 12.7 percent in 1980 to -2.4 percent in 1983.

1/ These firms are grouped into three size classes, as follows, based on the value of domestic open-market shipments: class 1, less than $30 million; class 2, $30 million to less than $100 million; and class 3, $100 million or more.

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Table 15.--Selected financial data from U.S. operations relating to the production of ball and roller bearings and parts, 1980-84, January-June 1984, and January-June 1985

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Net sales							
million dollars--	2,989	3,355	2,676	2,668	3,273	1,600	1,613
Cost of goods sold--do----	2,419	2,697	2,228	2,246	2,622	1,273	1,314
Gross profit--------do----	570	658	448	423	651	328	300
General, selling, and administrative expenses							
million dollars--	291	375	376	362	402	197	210
Operating profit or (loss)----------do----	278	283	72	60	248	131	91
Other income or (expense)							
million dollars--	(64)	(40)	(2)	(24)	(82)	(33)	(41)
Net profit (loss) before income taxes------do----	213	243	70	36	168	98	54
Depreciation and amortization expense							
million dollars--	107	123	137	150	145	72	77
Cash-flow (deficit) from operations							
million dollars--	320	366	207	187	313	170	131
As a share of net sales:							
Cost of goods sold							
percent--	80.9	80.4	83.3	84.2	80.1	79.6	81.5
General, selling, and administrative expenses percent--	9.7	11.2	14.1	13.6	12.3	12.3	13.0
Gross profit or (loss)							
percent--	19.1	19.6	16.7	15.9	19.9	20.5	18.6
Operating profit or (loss)-------percent--	9.3	8.4	2.7	2.2	7.6	8.2	5.6
Net profit or (loss) before income taxes							
percent--	7.1	7.2	2.6	1.3	5.1	6.1	3.3
Number of firms reporting operating loss----	5	6	13	10	6	7	8
Number of firms reporting net loses---------	7	6	16	12	9	7	10

1/ The 38 firms that reported accounted for 90 percent of U.S. shipments in 1984.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Capital investment

As shown in table 16, U.S. producers' capital expenditures for domestic facilities engaged in the production of ball and roller bearings and parts, as reported in response to the Commission's questionnaire, declined from $267 million in 1980 to $115 million in 1983, then increased to $129 million in 1984. During January-June 1985, such expenditures amounted to $58 million compared with $50 million during January-June 1984. Although much smaller than capital expenditures for domestic facilities, U.S. producers' capital expenditures for foreign facilities rose from $10 million in 1980 to $12 million in 1984 but were down somewhat during January-June 1985. During 1980-81, the ratio of capital expenditures as a percent of net sales for the U.S. bearing industry exceeded that for all U.S. machinery (except electrical) industries, but fell by 1983-84 to below the all industry level, and by January-June 1985, was between a half and a third of the 1980-82 ratios, according to data submitted in reponse to questionnaires of the U.S. International Trade Commission and data from the U.S. Department of Commerce (see the following tabulation):

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Total capital expenditures for the U.S. ball and roller bearing industry percent--	8.9	7.1	6.6	4.3	3.9	3.6	3.1
Total capital expenditures for the total machinery (except electrical) industry---------percent--	6.4	6.5	7.1	6.9	6.9	1/	1/

1/ Not available.

U.S. producers reported to the Commission that, as of June 1985, 43 percent of the machinery and equipment in place in their plants was 20 years or older (table 17). Of the five categories of equipment identified by this survey, numerically controlled (NC) and computer numerically controlled (CNC) "green" equipment, including all equipment used during the forming or turning processes in the manufacture of bearings, was by far the most recently acquired; 61 percent of such equipment has been purchased in the last 5 years.

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Table 16.--Ball and roller bearings and parts: U.S. producers' capital expenditures for U.S. and foreign facilities, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Location and item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
United States:							
Land, land improvements	2,641	1,137	2,122	122	1,165	20	2,018
Buildings, leasehold improvements	39,557	17,568	18,314	3,738	9,772	2,556	6,015
Machinery, equipment, and fixtures:							
New 1/	208,214	206,735	147,914	105,879	113,495	44,555	48,451
Used	15,018	11,081	5,623	4,194	3,960	2,203	1,194
Other	1,792	1,149	1,574	1,037	752	275	386
Total	267,222	237,670	175,547	114,970	129,144	49,609	58,064
Foreign:							
Land, land improvements	22	2	0	0	51	9	5
Buildings, leasehold improvements	460	2,995	385	462	720	195	133
Machinery, equipment, and fixtures:							
New 1/	9,088	8,995	9,361	9,207	10,984	5,710	4,523
Used	51	46	0	23	0	0	0
Other	21	37	31	22	30	10	308
Total	9,642	12,075	9,777	9,714	11,785	5,924	4,969

1/ Includes only new machinery not previously employed.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 17.--Ball and roller bearings and parts: U.S. producers' machinery and equipment, by ages and types, as of June 1985 1/

(Number of units)

Item	Age in years				
	0-5	6-9	10-19	20 and over	Total
Green equipment: 2/					
Mechanical	968	1,051	2,146	2,997	7,162
NC/CNC	327	131	68	14	540
Heat-treating equipment	400	359	722	988	2,469
Grinding and finishing equipment	1,862	1,782	4,007	4,256	11,907
Other 3/	6,726	6,340	13,840	22,255	49,161
Total	10,283	9,663	20,783	30,510	71,239

1/ A machine that is rebuilt and upgraded to current technology is considered a new machine for the purpose of this table.

2/ "Green" equipment includes all equipment used during the forming or turning processes in the manufacture of bearings.

3/ Includes tool room, assembly, and packaging machinery and equipment.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

The following tabulation compares the ratios of domestic capital expenditures to net sales by U.S. bearing producers for three groups of U.S. producers based on size of bearing shipments. Although the patterns were generally similar, firms with sales of $100 million or more dropped more sharply in 1983 and 1984 than the smaller firms, whereas firms with sales of less than $30 million made substantial domestic capital expenditures compared with their net sales during January-June 1985:

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Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Ratio of domestic capital expenditures to net sales:							
Firms with sales of less than $30 million percent--	9.8	6.1	5.4	4.0	5.0	5.0	12.3
Firms with sales of $30 million to less than $100 million-percent--	7.8	5.8	5.2	6.3	6.5	3.3	3.0
Firms with sales of $100 million or more percent--	9.1	7.4	6.8	3.9	3.3	2.9	3.0

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Firms with sales of less than $30 million that reported data to the Commission indicated that 40 percent of their machinery and equipment was 20 years and over, whereas 4 percent of their "green" machinery and equipment consisted of the NC or CNC type. By contrast, firms with sales of $30 million to less than $100 million reported 34 percent of their machinery and equipment was 20 years or over and 9 percent of their "green" equipment was the NC or CNC type. Although firms with sales of $100 million or more had the highest percent of machinery and equipment 20 years or older (44 percent), NC or CNC "green" accounted for 7 percent of their total "green" equipment.

Research and development

Research and development expenditures have increased rapidly in the U.S. ball and roller bearing industry in response to increasing foreign competition. Several companies in the industry are automating their production facilities by introducing computerized manufacturing systems, industrial robots, and advanced inspection machinery. 1/

Most major U.S. manufacturers have extensive research facilities concentrating in areas of materials, production processes, and metallurgy. In order to remain technologically competitive, bearing producers have increased R&D expenditures to improve efficiency, productivity, and quality. 2/ Timken Co., the largest U.S. producer of tapered roller bearings, has a technical staff of over 400 individuals working at the research and development facility

1/ Information submitted in response to questionnaires of the U.S. International Trade Commission.

2/ Statement on behalf of the Anti-Friction Bearing Manufacturers Association, Sept. 26, 1985, p. 13.

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in Canton, Ohio. According to Mr. Toot, the president of the Timken Co., the actual investment in the Canton facility is more than $30 million. 1/

The U.S. Government has a technical modernization (Tech Mod) and industrial modernization incentive program (IMIP) available to defense contractors that provides funding and other assistance to help develop new technologies. 2/ The Government provides the funds for the contractors to study their operations, determine what areas need changes, and how to implement those changes. Fafnir Bearing Co., a producer of high precision bearings, joined the Tech Mod program with the United States Air Force (USAF) San Antonio Air Logistics Command at Kelly AFB, Texas. In September 1985, Fafnir Bearing Co. was authorized to begin a $2 million technology modernization program at its aerospace bearing division. 3/ This modernization program was designed to improve the quality and life rate of the bearing, to utilize materials more efficiently, and to develop systems that exercise control of cost and planning. Fafnir hopes to improve product quality, cut procurement costs and reduce delivery time with this new research and development program.

Most major bearing producers are modernizing to take advantage of the immense data processing capacity of computers, which give instant information on the way minute changes in design can effect bearing performance. 4/ The expanding use of computer-aided design (CAD) and manufacturing (CAM) techniques is important in improving production processes. The use of computers has improved quality as well as lowered cost of bearing production. 5/ The Timken Co. uses robots to perform loading, unloading, and other repetitive tasks and has set up programmable machine tools on the shop floor. Federal Mogul has installed CAD and CAM systems as well as automated grinders. The Torrington Co. has developed a fully integrated CAD/CAM system that electronically transfers bearing designs on a computer to the machine tools on the shop floor. 6/

R&D expenditures reported by U.S. producers increased significantly during 1980-84, from $36 million to $54 million. R&D on roller bearings accounted for 46 percent of total industry research and development expenditures in 1980, and increased to 54 percent in 1984. Expenditures during January-June of 1984-85 for roller bearings increased only 4 percent, from $26 million to $29 million. R&D on ball bearings and parts represented 40 percent of all expenditures in 1980, decreasing to 39 percent in 1984 (table 18). During January-June 1984 and January-June 1985, expenditures for ball bearings increased 26 percent. Only 39 companies of the 78 producers responding to the Commission's questionnaire reported R&D expenditures, but those responding accounted for 90 percent of total shipments of ball and roller bearings in 1984.

1/ Transcript of the hearings, Oct. 3, 1985, p. 69.
2/ American Metals Market, Nov. 5, 1984, p. 14.
3/ Aviation Week & Space Technology, Sept. 16, 1985, p. 87.
4/ The World of SKF, Publication No. 3277E.
5/ Posthearing brief, Timken, p. 4.
6/ The Analytic Sciences Corp. for FEMA, Cost-Effective Operations to Enhance U.S. Industrial Mobilization Potential, Sept. 28, 1984, pp. 4-23.

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Table 18.--Ball and roller bearings and parts: U.S. producers' research and development expenditures, by major bearing types, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Period	Bearing type		
	Ball bearings and parts 1/	Roller bearings and parts 1/	Total
1980	14,169	16,311	35,596
1981	13,864	24,010	43,024
1982	15,036	26,260	47,267
1983	15,478	24,726	45,505
1984	18,518	28,952	53,761
January-June--			
1984	9,108	13,954	26,083
1985	11,445	14,564	29,227

1/ Subtotals are understated because 2 companies did not report R&D, by type.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Government assistance

Ball bearings are an essential component of many weapons and other military equipment. Consequently, the Department of Defense has encouraged public policies designed to ensure that the U.S. ball bearing industry is capable of meeting potential wartime demand for bearings. In 1969, the industry petitioned the Office of Emergency Preparedness (OEP) of the Department of Defense, requesting an investigation to assess the effect on national security of imports of miniature and precision bearings. Following an investigation, the Department of Defense issued an official directive (ASPR 1-2207) mandating that all DOD purchases of bearings 30 millimeters or less must be from U.S. or Canadian sources. This directive remains in effect.

In 1975, the United States Trade Representative (USTR) granted the ball bearing industry a special exemption from the Generalized System of Preferences (GSP). USTR removed ball and roller bearings from the GSP list. The 11 percent rate of duty was established in the Kennedy round of trade negotiations in the 1960's, and has not been reduced in subsequent negotiations. USTR has attempted to insulate the bearings industry from tariff reductions to help maintain the industry's defense production capacity.

The USAF and the U.S. Army have proposed a technology modernization program that would assist the U.S. aerospace bearings industry in modernizing its facilities. If the total program is approved, Government funding for technology development is estimated at $25 million over a 3-year period. Plans for the program emerged in response to a USAF study that indicated that the aerospace bearings industry might not be able to meet production demand in wartime, or even in peace time, under conditions of sharply increased demand.

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The program's director hopes to achieve a 20-percent reduction in the cost of manufacturing bearings for the aerospace industry. The use of advanced materials, such as carburizing alloys, and the use of new manufacturing technologies will be examined under the program.

Profile of Major Foreign Industries

West Germany

The West German ball and roller bearing industry consists of about 24 companies, 12 of which produce 5 or more types of bearings. However, the industry is dominated by three companies--FAG Kugelfischer Georg Schafer KG (FAG), SKF Kugellagerfabriken GmbH (SKF), and INA Walzlager Schaeffler KG. FAG and SKF account for about 80 percent of total output of ball and roller bearings.

FAG Kugelfischer Georg Schaefer KGAA is estimated to account for 45 percent of total West German production. FAG is a family-owned business founded in 1883, and located in Schweinfurt, West Germany; it includes 11 plants in West Germany and 6 abroad. During 1980-1984, FAG's employment declined 12 percent, from 25,064 in 1980 to 22,052 in 1984. Basic capital in 1983 for FAG was DM165 million.

SKF Kugellagerfabriken GMBH accounts for 35 percent of total production in the West German bearing industry. SKF is wholly owned by Aktiebolaget SKF of Goteborg, Sweden, and operates five production plants in West Germany employing 9,100 persons. In 1983, basic capital for SKF's German operations was estimated at DM200 million. No data are available for INA Walzlager Schaeffler KG or other West German manufacturers.

The following tabulation selected from the World List, Anti-Friction Bearing Manufacturers Association, 1984, lists West German bearing manufacturers producing five or more bearing types:

Firm	Location
FAG Kugelfischer Georg Schafer, KG	Schweinfurt
SKF Kugellager Fabriken GmbH	Schweinfurt
INA Walzlager Schaeffler, KG	Herzogenaurach
Artur Seyfert GmbH & Co., KG	Stuttgart
Artur Kupper GmbH & Co., KG	Velbert
Rothe Erde - Schmiedag, AG	Dortmund
Torrington GmbH	Wurselen
Frankenjura Industrie GmbH	Erlangen
Franke & Heydrich, KG	Aalen
Emil Baltzer GmbH & Co., KG	Duisburg
GMN George Muller Nurnberg GmbH	Nurnberg
Maschinenfabrik Joseph Eich, KG	Hattingen

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West German production of ball and roller bearings increased from DM3.1 billion in 1980 to DM3.7 billion in 1984, or by 19 percent. Roller and needle bearings represented the largest increase in production, increasing from DM1.6 billion in 1980 to DM2.1 billion in 1984, as shown in the following tabulation (in millions of Deutsche marks): 1/

Type of bearing	1980	1981	1982	1983	1984
Ball bearings	1,145	1,185	1,095	1,024	1,146
Roller and needle bearings	1,636	1,714	1,922	1,818	2,067
Other and parts	366	368	366	343	442
Total	3,147	3,267	3,383	3,185	3,655

West German exports of bearings totaled DM1.6 billion in 1980 and increased to DM2.0 billion in 1984, or by 25 percent. During 1984, exports from West Germany to the European Community (EC) accounted for 40 percent of total West German exports, or DM800 million, exports to the United States represented 10 percent of total West German exports, or DM200 million, as shown in the following tabulation (in millions of Deutsche marks): 2/

Period	Exports to the EC	Exports to the United States	Total exports
1980	800	100	1,600
1981	700	200	1,800
1982	700	200	1,700
1983	700	200	1,600
1984	800	200	2,000
January-June			
1984	400	100	1,000
1985	400	100	1,000

West German export sales accounted for 50 percent of total sales in 1984, or DM1.0 billion.

Employment data are not available for the West German ball and roller bearing industry, except for that of individual producers already furnished. Furthermore, there are no statistics available for R&D expenditures; however, significant amounts have been spent to introduce new production- and design-related technologies, including CAD/CAM systems according to annual reports of German-owned companies.

1/ Fachgemeinsheft, Antriebstechnic (Bearing Association in West Germany).
2/ U.S. Department of State telegram.

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All companies in West Germany operate privately and there is no known Government assistance for the industry, according to U.S. Embassy information.

Japan

Thirty Japanese firms produce ball bearings and 25 produce roller bearings. 1/ In 1983, the leading five producers of ball bearings in Japan accounted for 82.4 percent of Japanese production. The leading five producers of roller bearings in 1983 accounted for 93.4 percent of Japanese production. Table 19 lists production shares of the leading five producers of ball bearings and roller bearings respectively, from 1980 to 1983.

Table 19.--Ball and roller bearings: Share of Japanese production by major producers, by types and firms, 1980-83 1/

Type and firm	1980	1981	1982	1983
Ball bearings:				
NTT Toyo bearing Co., Ltd	29.1	31.8	38.6	15.1
Nippon Seiko K.K	30.9	30.3	29.7	22.5
Koyo Seiko Co., Ltd	24.9	24.6	24.6	19.7
Nachi-Fujikoshi, Corp	8.7	9.1	9.6	14.1
Minebea Co., Ltd	8.8	10.9	11.2	11.2
Roller bearings:				
NTT Toyo bearing Co., Ltd	28.3	28.5	28.3	36.8
Nippon Seiko K.K	23.1	22.8	21.9	19.5
Koyo Seiko Co., Ltd	22.8	22.6	21.2	22.1
Nachi-Fujikoshi, Corp	18.8	18.9	11.1	9.4
Nippon Thompson Co., Ltd	5.3	6.1	6.6	5.6

1/ Numbers shown are estimates appearing in Japanese publications and may add to more than 100 percent in a given year.

Source: World List, Anti-Friction Bearing Manufacturers Association, 1984.

Total aggregate production and producers' sales of ball, roller, and mounted bearings in Japan between 1980 and January-June 1985, according to "Machinery statistics" MITI, are shown in the following tabulation:

1/"Market Share in Japan," Yano Research Institute.

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Period	Production	Sales
	1,000 units	Million yen
Ball bearings:		
1980	972,318	201,844
1981	1,815,062	214,742
1982	1,037,798	210,468
1983	1,130,285	213,361
1984	1,396,078	257,984
1985 (January-June)	739,263	137,429
Roller bearings:		
1980	480,783	166,077
1981	497,507	180,547
1982	484,957	178,387
1983	507,854	169,973
1984	597,854	196,281
1985 (January-June)	311,477	103,849
Ball bearings and roller bearings with mountings:		
1980	29,804	26,189
1981	28,469	26,607
1982	25,415	23,513
1983	27,287	23,167
1984	35,237	27,902
1985 (January-June)	16,441	13,363

Japan's exports of ball bearings, roller bearings, and balls and rollers for bearings appear in table 20.

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Table 20.--Ball and roller bearings: Japanese exports to the United States and to all other countries, by types, 1980-84, and January-June 1985

Period	United States		All other countries	
	Quantity (Metric tons)	Value (Million yen)	Quantity (Metric tons)	Value (Million yen)
	Ball bearings			
1980	8,963	20,823	24,704	42,810
1981	9,727	22,520	26,357	44,216
1982	7,497	20,182	24,114	42,367
1983	7,485	19,018	36,619	42,326
1984	13,317	30,533	28,892	45,360
1985 (Jan.-June)	6,515	16,153	14,801	23,513
	Roller or needle roller bearings			
1980	5,139	6,934	23,170	31,408
1981	6,211	8,953	20,682	30,019
1982	5,219	9,885	20,281	30,773
1983	7,426	12,752	20,419	26,638
1984	12,793	21,302	21,668	27,473
1985 (Jan.-June)	5,699	9,937	10,486	13,712
	Balls, rollers, or needle rollers for bearings			
1980	1,305	1,221	6,434	5,893
1981	1,349	1,300	5,423	5,619
1982	958	1,048	3,538	4,123
1983	761	8,582	3,517	4,012
1984	1,258	1,372	3,807	5,472
1985 (Jan.-June)	1/	1/	1/	1/

1/ Not available.

Source: Japanese Customs and Tariff Bureau, Ministry of Finance.

The share of total Japanese exports of ball and roller bearings accounted for by exports to the United States increased significantly from 1980 to 1985, according to data derived from the Japanese Customs and Tariff Bureau, Ministry of France, as shown in the following tabulation (in percent):

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Period	Ball bearings		Roller and needle roller bearings	
	Share of total quantity	Share of total value	Share of total quantity	Share of total value
1980	26.6	32.7	18.2	18.1
1981	27.0	33.7	23.1	23.0
1982	23.7	32.3	20.5	24.3
1983	17.0	31.0	26.7	32.4
1984	31.3	40.2	37.1	43.7
1985 (January-June)	30.1	40.7	35.2	42.0

	Selected components (balls, rollers, and needle rollers) for bearings	
	Share of total quantity	Share of total value
1980	16.9	17.2
1981	19.9	18.8
1982	21.3	20.3
1983	17.8	17.6
1984	24.9	20.0
1985 (January-June)	1/	1/

1/ Not available.

Japanese exports to the United States of roller or needle roller bearings as a share of total Japanese exports of such commodities showed the sharpest increase, rising from 18.2 percent in 1980 to 35.2 percent during January-June 1985 (in terms of quantity) and from 18.1 percent to 42 percent (in terms of value). Japanese exports of ball bearings to the United States as a share of total Japanese exports of such commodities also increased significantly in the same period, rising from 26.6 percent to 30.1 percent (in terms of quantity) and from 32.7 percent to 40.7 percent (in terms of value). Japanese exports to the U.S. of selected bearings components (balls, rollers, or needle rollers for bearings) as a share of total Japanse exports of such commodities also increased from 1980 to 1984, rising from 16.9 percent in 1980 to 24.9 percent in 1984 (in terms of quantity) and from 17.2 percent to 20.0 percent (in terms of value).

Thus, the U.S. market has become a much more significant market for Japanese exporters in the past 5 years, especially for roller or needle roller bearings.

Japanese firms also appear to have increased foreign direct investments in the United States. In the early 1970's, several Japanese ball bearing firms began to produce in the United States. In 1971, Nippon Miniature Bearings bought an SKF plant in the United States and NTN Toyo Bearings started a factory in Chicago. In 1973, NSK purchased 50 percent of Hoover Ball Bearings and subsequently purchased the remaining share in 1975. More recently, two Japanese firms have acquired interests in U.S. ball bearing firms. NTN has entered into an agreement with Federal Mogul to purchase 50

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percent of that firm's tapered bearings operations, and the Minebea Co. purchased New Hampshire Ball Bearings.

In February 1985, the Minebea Co. of Japan received approval from the U.S. Department of Justice to purchase New Hampshire Ball Bearings, a small U.S. firm with special expertise in miniature ball bearing production. The acquisition of New Hampshire Ball Bearings will enable Minebea to solidify and expand its position in the U.S. market, according to U.S. industry sources. The decision by Justice to approve of this acquisition aroused the resentment of some U.S. bearings industry officials. The Antifriction Bearing Manufacturers Association speculated that Justice would have likely barred--on antitrust grounds--any attempt by an American manufacturer to purchase New Hampshire Ball Bearings. 1/

The acquisition was also reviewed by the DOD, which was concerned over the possible consequences for national security of foreign control of a major U.S. producer of miniature ball bearings (which are critical components of many high-tech weapons). DOD approved the purchase, however, when Minebea reassured it that the firm's U.S. manufacturing facilities would remain under the direct control of the U.S. subsidiary and still be available to handle military contracts. 2/

The Japanese ball and roller bearing industry appears to receive no direct financial support from the Japanese government. The U.S. embassy in Tokyo did report, however, that in December 1978, the Japanese Ministry of International Trade and Industry (MITI) worked out target figures for the Japanese bearings industry concerning quality and specification of bearings, production volume by types and company, and desirable levels of machinery and plant equipment to be installed. The achievement of these target figures is not mandatory to producers, according to MITI.

For certain types of bearings MITI instructed the four largest producers (NTT Toyo Bearings, Nippon Seiko, Woyo Seiwo and Nachi-Fujiwoshi) to take a joint action to limit type of bearings, by company, that they can produce. The objective of the program was apparently to maximize efficiencies from economies of scale in production. According to MITI, the ratio of the sales of bearings subject to the MITI program to the total sales of the four companies was less than 3 percent. In addition to the program discussed above, 18 producers of ball and roller bearings organized an export cartel in accordance with the "Export and Import Transaction Law" to establish floor prices for exports to the U.S. and European countries. 3/

Sweden

SKF AB of Goteborg is Sweden's only manufacturer of ball and roller bearings. SKF is privately owned and, according to the U.S. Embassy in Sweden, receives no Government assistance. Recently released company information 4/ indicates that of the SKF Group's 803 million kronor profit after financial

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1/ ITC staff interviews with ABMA officials.

2/ "New Hampshire Ball's Acquisition Clears U.S. Agency," Wall Street Journal, Feb. 27, 1985, p. 22.

3/ Telegram from U.S. Embassy, Tokyo.

4/ SKF Press Release, half-year report, 1985.

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income and expenses, rolling (ball and roller) bearings accounted for 582 million kronor, or 72 percent of such profits during January-June 1985. In the spring of 1985, this company's parent reported the acquisition of all shares in SKF Espanola, a production facility with 1,000 employees and a 35-percent share of the Spanish ball and roller bearing market. SKF indicated that from its perspective, the continuing large supply of imported bearings in the United States led to even keener price competition, creating difficulty for its local bearing manufacturing operations. This company concluded that the slower growth rate in the American market and increasing competition from imports had an adverse effect on SKF Industries, leading to reduced sales and eroded income; thus, forcing costly restructuring operations in the firm's U.S. facility.

Other SKF corporate reports indicate that in 1984, SKF had twice the world-market share of its closest world competitor. SKF officials stated that their products gained their position mainly through four competitive strengths--international presence, product quality, technical service, and delivery performance.

In its 1983 Annual Report, SKF estimated that the sales value of world ball and roller bearing production, excluding Comecon and China, was 60 billion kronor ($7.5 billion). Three-quarters of this production, it was reported, was shared almost equally between U.S. and European manufacturers. The major part of the remaining production was accounted for by Japan, whereas the developing countries took slightly more than 5 percent of the total. SKF supplies almost 20 percent of the Western World's bearing demand. According to SKF, the next largest companies are one in the United States, one in Europe, and two in Japan. Additionally, the company reported that only 10 of the more than 200 bearing manufacturers throughout the world have a world-market share of 1 percent or more.

During 1980-84, the total number of employees at the SKF plant in Sweden remained relatively constant, ranging from a low of 2,198 in 1983 to a high of 2,342 in 1981. The number of production workers was similarly lowest in 1983 (1,981) and highest in 1981 (2,122). Wages, including fringe benefits, contributions and taxes for all employees and production workers were as follows (in millions of kronor): 1/

Period	All employees	Production workers
1980	221.3	204.5
1981	266.7	248.7
1982	284.5	263.7
1983	282.7	257.8
1984	337.9	306.8
1985 (January-June)	203.0	184.0

Capital expenditures by SKF in Sweden totaled 41.1 million kronor in 1980, 61.3 million kronor in 1982 and 1983, 60.8 million kronor in 1984 and

1/ These data were supplied by the U.S. Embassy, Stockholm.

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20.1 million kronor during January-June 1985. As mentioned elsewhere, SKF supplies the market mainly from its production facilities in the U.S. Total exports to the United States from Sweden during January 1980-June 1985 were as follows:

Period	Ball bearings		Roller bearings		Balls and rollers	
	Million kronor	Million dollars	Million kronor	Million dollars	Million kronor	Million dollars
1980	14.6	3.5	36.0	8.5	0.23	.05
1981	24.8	4.9	53.6	10.6	-	-
1982	24.0	3.8	14.8	2.4	-	-
1983	29.2	3.7	19.5	2.4	.11	.01
1984	43.1	5.2	24.3	2.9	-	-
1985 (January-June)	35.7	4.3	11.9	1.4	-	-

Total exports to other markets, much more significant than those to the United States, were as follows:

Period	Ball bearings		Roller bearings		Balls and rollers	
	Million kronor	Million dollars	Million kronor	Million dollars	Million kronor	Million dollars
1980	292.6	69.3	363.4	86.1	24.0	5.6
1981	327.5	64.6	384.4	75.8	21.8	4.3
1982	330.0	52.5	430.8	68.5	23.8	3.8
1983	383.2	48.1	442.6	55.5	22.2	2.8
1984	419.4	50.8	492.3	61.8	62.9	2.9
1985 (January-June)	250.1	30.2	285.9	34.5	42.0	5.3

United Kingdom

Although there are some smaller companies manufacturing bearings in the United Kingdom, production is dominated by the following five companies: the RHP Group (Ransome, Hoffman, and Pollard Bearings, Ltd.), SKF, Ltd. (United Kingdom), a subsidiary of the Swedish company, and three U.S.-owned companies--British Timken, Fafnir Bearing Co., and the Torrington Co. Demand for bearings in the United Kingdom market declined during 1972-82 and in 1980, demand was at about 60 percent of the level of the mid-1970's. This declining demand, combined with intense competition, forced the United Kingdom industry to rationalize production. Those companies that were part of multinational corporations were able to carry this out on an international basis by concentrating production of particular types of bearings at certain locations. Currently in the United Kingdom, all of the companies, except RHP, centered production at one location with a limited range of bearings. (RHP

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reported in its 1984 Annual Report and Accounts that it experienced an increase in sales value, although volume changed little, reflecting a continuing policy of increasing penetration in the more specialized and higher technology areas, and reducing business in those areas subject to intense price competition.) All of the major companies, except RHP, have been able to achieve the economies of scale necessary to remain competitive in the high-volume, popular metric types of bearings.

The U.S. Embassy reported that investment in Britain's bearings industry held up well through the 1970's and early 1980's and that the industry continues to recognize the need for modern efficient plants. Current employment in the industry is estimated at 12,000.

United Kingdom sales of ball, needle, and roller bearings and parts remained at about the same level during 1981-84, dropping from 212.5 million pounds in 1981 to 202.4 million pounds in 1983, then increasing to 215.1 million pounds in 1984. Sales during January-March 1985 totaled 70.8 million pounds, 24 percent above January-March 1984 (table 21).

United Kingdom exports of ball, needle, and roller bearings and parts declined slightly from 109.9 million pounds in 1982 to 104.7 million pounds in 1983, then rose to 129.6 million pounds in 1984. United Kingdom exports during January-March 1985 reached 38.3 million pounds, 17 percent above January-March 1984 (table 22). Exports as a share of total sales varied from a low of 50 percent in 1983 to a high of 60 percent in 1984, then dropped to 54 percent during January-March 1985.

Table 21.--Ball, needle, or roller bearings and parts: United Kingdom sales, 1981-84, January-March 1984, and January-March 1985

(In thousands of United Kingdom pounds)

Item	1981	1982	1983	1984	January-March-- 1984	January-March-- 1985
Ball, roller, or needle roller bearings:						
Ball bearings	86,977	80,979	75,285	84,455	22,853	26,389
Parts of ball bearings	4,175	1,870	1,681	1,870	507	596
Roller or needle roller bearings	103,528	105,264	97,081	92,210	14,218	28,414
Parts of roller or needle roller bearings	4,967	4,214	4,257	4,632	1,104	1,565
Other sales of above products	12,841	17,333	24,100	32,000	8,600	13,800
Total	212,488	209,660	202,404	215,127	57,282	70,764

Source: HMSO, Government Statistical Service, Business Monitor, various issues.

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Table 22.--Ball, needle, or roller bearings and parts: United Kingdom exports, 1982-84, January-March 1984, and January-March 1985

(In thousands of United Kingdom pounds)

Item	1982	1983	1984	January-March-- 1984	January-March-- 1985
Bearings:					
Balls	42,406	39,517	48,307	12,631	16,170
Needle rollers	5,135	5,405	6,860	1,902	2,271
Tapered rollers	27,920	22,726	28,402	6,414	7,681
Cylindrical rollers	5,056	4,634	5,244	1,541	1,388
Other rollers:					
Spherical roller	9,618	8,807	7,822	1,723	1,568
Other	7,388	10,534	10,474	2,706	2,650
Parts:					
Balls, needles or rollers:					
Tapered rollers	895	1,291	2,214	344	455
Other:					
Balls for ball bearings	1,153	574	1,461	228	418
Other	1,156	1,058	2,309	593	1,215
Other:					
Other parts of ball bearings	704	776	749	253	417
Other	5,150	6,163	11,322	3,292	3,133
Housings	3,349	3,215	4,470	1,189	977
Total	109,930	104,700	129,634	32,816	38,343

Source: HMSO, Government Statistical Service, Business Monitor, various issues.

United Kingdom imports of ball, needle, and roller bearings and parts rose slightly from 104.7 million pounds in 1982 to 108.4 million pounds in 1983 and then rose sharply to 142.9 million pounds in 1984. Imports during January-March 1985 reached 44.3 million pounds, representing an increase of 28 percent over that of January-March 1984 (table 23). The United Kingdom enjoyed a slight trade surplus in these products of 5.3 million pounds in 1982 but, thereafter, experienced a trade deficit that reached 13.3 million pounds in 1984 and 5.0 million pounds during January-March 1985.

Canada

Although trade directories list over a dozen firms manufacturing ball and roller bearings and parts in Canada, the U.S. Embassy identified the following four companies as major producers: Canadian Timken; FAG Bearings, Ltd.; NTN Bearing Corp. of Canada; and Torrington, Inc. Canadian Timken is 100-percent owned by the Timken Co., U.S.A. FAG Bearings, Ltd., is 50-percent owned by G. and J. Jaeger GMBH and 49.98-percent owned by SRO Kugellager-werke J. Schmid-Roost AG, both of West Germany, and both 100-percent owned by FAG Ugelfischer Georg Schafer & Co., West Germany. NTN Bearing Corp. of Canada, Ltd., is 99.99-percent owned by NTN Toyo Bearing Co., Ltd., Japan. Torrington

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Table 23.--Ball, needle, or roller bearings and parts: United Kingdom imports, 1982-84, January-March 1984, and January-March 1985

(In thousands of United Kingdom pounds)

Item	1982	1983	1984	January-March--	
				1984	1985
Bearings:					
Balls	96,507	48,190	61,542	14,042	21,547
Needle rollers	8,482	9,526	10,952	2,682	2,835
Tapered rollers	11,400	11,924	16,841	4,272	4,570
Cylindrical rollers	4,778	4,564	4,719	1,185	1,627
Other rollers:					
Spherical roller	7,778	7,392	8,234	2,384	2,817
Other	9,118	11,006	15,937	3,713	5,351
Parts:					
Balls, needles or rollers:					
Tapered rollers	1,496	1,479	1,467	300	374
Other:					
Balls for ball bearings	4,205	2,888	4,848	1,396	1,241
Other	3,405	2,585	6,524	1,449	820
Other:					
Other parts of ball bearings	695	1,063	2,550	521	814
Other	2,858	4,719	5,404	1,615	1,317
Housings	3,931	3,045	3,889	1,008	987
Total	104,653	108,381	142,907	34,567	44,300

Source: HMSO, Government Statistical Service, Business Monitor, various issues.

Inc. is 100-percent owned by Ingersoll-Rand Inc., Canada, which is, in turn, wholly owned by Ingersoll-Rand Co., U.S.A.

The Canadian ball and roller bearing industry is small; shipments of ball and roller bearings and parts totaled $114 million in 1981 and $83 million in 1982. Employment data for this industry was only available in 1982, ranged as follows: Canadian Timken, between 200 and 499; FAG Bearings, Ltd., between 500 and 999; NTN Bearing Manufacturing, Ltd., between 50 and 99; and Ingersoll-Rand, Torrington Division, between 100 and 199.

According to the U.S. Embassy in Ottawa, total Canadian exports of bearings and parts for motor vehicles and bearings not elsewhere specified appear in the following tabulation (in thousands of dollars):

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Type and destination	1980	1981	1982	1983	1984	January-May 1985
Bearings and parts for motor vehicles:						
United States	10,558	13,657	30,772	42,969	50,034	22,224
Other markets	1,725	2,874	7,166	5,401	4,063	1,474
Total	12,283	16,531	37,938	48,370	54,097	23,698
Bearings not elsewhere classified:						
United States	28,591	37,618	19,153	19,528	24,577	10,808
Other markets	14,416	17,867	5,004	3,695	3,866	1,383
Total	43,007	55,485	24,157	23,223	28,443	12,191

The U.S. Embassy reported to the Commission that there appeared to be no Government ownership nor any tax allowances that would favor the Canadian ball and roller bearing industry.

France

The French ball and roller bearing industry consists of seven manufacturers, with five of them making up 98 percent of market share. There are no Government assistance programs for the industry; however, Societe Nouvelle De Roulements S.A. (SNR) is a fully owned subsidiary of Renault, a Government owned automobile manufacturer. The following tabulation shows the five major producers of ball and roller bearings in France, as provided for in a U.S. Department of State telegram:

Ownership and firm	Location
Government-owned:	
Societe Nouvelle De Roulements S.A. (SNR)	Annecy
Privately owned:	
S.K.F. Cie D'Applications mecaniques S.A.	Clamart
SNFA-S.A	Ivry/Seine
INA-Roulements S.A	Haguenau
Timken France	Colmar

Detailed information on the French ball and roller bearing industry is very difficult to obtain. The industry only publishes total annual sales figures; however, the following data were provided to the U.S. Embassy 1/ by an industry source in France.

Total production for ball and roller bearings rose from FF3.09 billion (44,000 tons) in 1983 to FF3.37 billion (45,000 tons) in 1984. This slight increase in production is principally due to increased demand by the major consuming industries. During 1984, the average number of employees in the bearing industry was 12,000 workers.

1/ Department of State telegram.

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Imports of ball and roller bearings increased 38 percent during 1980-84, from FF1.3 billion in 1980 to FF1.8 billion in 1984. Together, West Germany, Italy, and the United Kingdom accounted for 62 percent of all imports to France in 1984. The United States and Japan exported 10 percent and 7 percent, respectively, to France in 1984, as shown in the following tabulation (in thousands of francs): 1/

Country	1980	1981	1982	1983	1984
West Germany	494,519	502,097	586,013	596,769	655,888
Italy	169,514	182,493	193,929	195,843	283,360
United Kingdom	138,088	145,021	159,861	171,990	194,950
United States	144,358	166,527	173,627	163,438	177,838
Japan	97,578	117,076	140,975	135,087	134,873
Sweden	83,505	90,004	100,310	103,071	77,805
Switzerland	31,410	35,256	37,493	36,071	41,241
Austria	30,626	28,691	34,653	35,052	39,826
Romania	17,608	11,405	8,025	11,766	26,017
U.S.S.R	18,931	18,091	21,008	21,216	21,219
All other	111,587	129,073	144,528	147,303	183,719
Total	1,337,724	1,425,734	1,600,422	1,617,606	1,836,736

Exports of French ball and roller bearing increased 29 percent, from FF1.4 billion in 1980 to FF1.8 billion in 1984. Major export markets in 1984 were EC countries, especially West Germany and Italy. 2/

The U.S. Market for Ball and Roller Bearings

Description of the U.S. market

The U.S market for bearings consists primarily of the producers of motor vehicles and all other types of machinery and equipment. During 1983-85, the U.S. market for bearings increased because of the growth of the automotive industry as well as the slight increase in the production of farm and construction machinery. In 1977, about 24 percent of U.S. producers' shipments went to the automotive industry, 29 percent went to the industries producing farm machinery, general industrial machinery, and construction machinery, 8 percent went to the aircraft and parts industry, and the remaining 39 percent went to a number of smaller industries. 3/ Between 1977 and 1982, there were significant changes in the type of bearings used by consuming industries. In 1977, delivered cost of ball bearings for motor-

1/ Statistiques du Commerce Exterieur de la France, Ministe're de l'Economie, des Finances et du Budge Direction Generale des Douanes et Droits Indirects, 1980-84.

2/ Ibid.

3/ U.S. Department of Commerce, Bureau of the Census, Selected Material Consumers, MC-77-SR-11, 1977.

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vehicle parts and accessories accounted for $117 million compared with $184 million in 1982, increasing by 57 percent. Roller bearing consumption for the automobile industry decreased from $213 million to $144 million, or by 32 percent. Roller bearings are being replaced by lighter, more precise ball bearings. Consumption of ball bearings and parts for the pump and pumping equipment industry increased 179 percent, from $14 million in 1977 to $39 million in 1982; roller bearings for the same industry increased 157 percent, from $14 million to $36 million. Ball and roller bearing consumption for the railroad equipment industry decreased significantly during 1977-82, falling from $54 million in 1977 to $32 million in 1982, representing a 42-percent decrease. The total consumption of bearings by the major consuming industries accounted for 28 percent of total U.S. apparent consumption in 1982. The defense industry is an important consumer of ball and roller bearings; however, no public statistics on delivered cost of bearings for that industry are available. The following tabulation shows delivered costs of bearings, according to the 1982 Census of Manufactures by consuming industries, for 1977 and 1982 (in millions of dollars), including both domestic and imported products.

Consuming industry/type of bearing	1977	1982
	------Million dollars------	
Motor-vehicle parts and accessories:		
Ball bearings, components, and parts	117	184
Roller bearings, components, and parts	213	144
Farm machinery and equipment:		
Ball bearings, components, and parts	58	64
Roller bearings, components, and parts	43	35
Construction machinery:		
Ball bearings, components, and parts	58	50
Roller bearings, components, and parts	65	70
Aircraft engines and parts:		
Ball bearings, components, and parts	24	45
Roller bearings, components, and parts	22	41
Refrigeration and heating equipment:		
Ball bearings, components, and parts	37	35
Roller bearings, components, and parts	12	26
Pumps and pumping equipment:		
Ball bearings, components, and parts	14	39
Roller bearings, components, and parts	13	40
Oilfield machinery:		
Ball bearings, components, and parts	5	17
Roller bearings, components, and parts	14	36
Railroad equipment:		
Ball bearings, components, and parts	1	1/
Roller bearings, components, and parts	54	32
Total: 2/		
Ball bearings components, and parts	314	434
Roller bearings, components, and parts	436	424

1/ Less than $0.5 million.

2/ Total consumption reflected here represents only the total for the 8 industries shown in this tabulation and does not reflect total domestic consumption.

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Bearings are basically sold to original-equipment manufacturing industries and to wholesale distributors. More than one-half of all bearing sales are made to original-equipment manufacturers (OEM's). Replacement sales and distributor sales account for the rest of the bearings sold. Sales, by channel of distribution for various types of bearings and parts appear in the marketing section of this report. Industry sources indicate that imports accounted for over 50 percent of all sales to OEM's; however, no category breakouts were available. 1/

Factors influencing U.S. market demand

Several factors have affected U.S. market demand for bearings. In particular, there have been (1) worldwide geographical changes in the production locations of bearing-using goods, (2) design changes in the production of bearing-using goods, (3) structural changes in the U.S. economy, and (4) business cycles. An example of geographical change occurred in the consumer electronics industry, which largely moved to the Far East. Likewise, auto production diversified geographically. Although bearings are not necessarily produced near industries that use them, there is some tendency for this to occur, partly because of historical manufacturer/supplier relationships.

Design changes in bearing user industries have affected the composition and possibly the overall level of bearing demand. For instance, automobiles are much more likely to have front-wheel drive now than previously, eliminating much of the demand for tapered roller bearings used in auto differentials. However, front-wheel-drive cars use more bearings overall, especially of the tapered needle variety. In the United States, front-wheel-drive cars accounted for 56 percent of total units produced in 1984 compared with 37 percent in 1981. Design changes in railroad cars, on the other hand, have not changed appreciably the type of bearings used but have reduced the overall demand for these type of bearings since the trend has been to fewer, larger capacity cars. 2/

The motor-vehicle industry, particularly manufacturers of cars, trucks, and trailers, is easily the largest source of U.S. demand for bearings. Demand from this industry was reported to be near record levels during 1984-85. In contrast, the demand from railroads, oil producers, and farm machinery producers has declined sharply. Current railroad demand is reported to be at 20 percent of peak year (1978) demand, current farm-related demand (for 2-to-4-inch ball bearings) at 30 to 40 percent of their last peak year, and oilfield demand is minimal. Thus, for example, any type of tapered roller bearing applicable to oilfield applications is readily available because of demand weakness. The overseas capacity in ball bearing sizes under 52mm has grown sharply. 3/

Trade press reports indicate that there is currently a strong demand for tapered roller bearings, in 4-to-6-inch bore sizes, for use in machine tools; even stronger is the export demand for microminiature ball bearings used in

1/ Power Transmission Design, June 1984, p. 6.
2/ Purchasing, July 11, 1985.
3/ Purchasing, July 11, 1985.

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VCR's and the largely domestic demand for 2.5-to-5-inch tapered roller bearings for heavy trucks and trailers. Demand is also fairly strong for low-priced, high-volume bearings. 1/

According to one industry source, low volume, highly specialized bearings used for specific industrial or military applications are said to be of increasing importance. The production of these types of bearings has moved away from production by large bearing companies with high overheads toward production by very small, entrepreneurial-type operations. Typically, these small operations attract their business through referrals from the larger bearing companies. 2/

Major foreign competitors in the U.S. market

The Commission's questionnaire asked U.S. producers to identify their major competitors in the U.S. market, by type of bearing and parts, during January 1982-June 1985. The most important competitors, in order of the frequency mentioned, during 1982-83 were Japan, West Germany, and Sweden, whereas, other countries cited were France, Singapore, and Poland. During January-June 1985, Sweden was mentioned in more categories of bearings and parts more times than West Germany. During January 1984-June 1985, new countries mentioned as most important competitors were Canada, Italy, and Taiwan. Competitors by bearing types (denoted by X) appear in the following tabulation:

Country	Type of bearing	
	Ball bearing complete	Mounted ball bearings
France	X	-
Italy	X	-
Canada	X	-
Singapore	X	-
Taiwan	X	X
Poland	X	X

The Commission also asked questionnaire respondents to identify less important competitors during this period. During 1982-83, countries or groups of countries reported were Romania, the Republic of Korea, Switzerland, Austria, the People's Republic of China (China), the Council for Mutual Economic Assistance (COMECON), and Hungary. During January 1984-June 1985, Spain and Yugoslavia were cited. These lesser important competitors cited in the Commission's questionnaire, together with the type of bearings and/or parts, appear in the following tabulation:

1/ Op. cit.
2/ Ibid.

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Country/group	Type of bearing
Switzerland	Ball bearings complete
Austria	Ball bearings, complete; cylindrical and spherical roller bearings
Spain	Balls
China	Ball bearings, complete; cups for tapered roller bearings; cones and roller assemblies for tapered roller bearings
Hungary	Cups and cone and roller assemblies for tapered roller bearings
Yugoslavia	Cups and cone and roller assemblies for tapered roller bearings
COMECON	Ball bearings, complete; cups and cone and roller assemblies for tapered roller bearings; spherical roller bearings
Romania	Ball bearings, complete; cups for tapered roller bearings; spherical roller bearings; mounted ball bearings
Republic of Korea	Mounted ball bearings

As might be expected, Japan, West Germany, and Sweden were cited in this survey as important competitors in more bearing and parts categories than were other countries. Japan led the evaluation throughout the period, followed by West Germany, except during January-June 1985, at which time, Sweden was mentioned in more categories of bearings and parts, more times than West Germany. Other countries cited as most important competitors by bearing types and parts were France (ball bearings, complete), Italy (ball bearings, complete), Canada (ball bearings, complete), Singapore (ball bearings, complete), Taiwan (mounted ball bearings), and Poland (ball bearings, complete).

Producers' shipments

U.S. producers' shipments (including exports) of ball and roller bearings increased by 11 percent during 1980-84, from $3.3 billion to $3.6 billion in 1984, according to official statistics of Commerce (table 24). The value of shipments increased from 1980 to 1984 for all categories of bearing except tapered roller bearings. The value of shipments to tapered roller bearings decreased by 4 percent from 1980 to 1984, falling from $914 million in 1980 to $880 million in 1984. The decrease in U.S. producers' shipments of tapered roller bearings can be attributed to three factors:

(1) Automotive industries, major consumers of roller bearings, began producing lighter cars and trucks, for which ball bearings are often more suitable than roller bearings;

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(2) The construction machinery and railroad equipment industries, major consumers of tapered roller bearings, experienced depressed economic conditions in the early 1980's, resulting in decreased demand for roller bearings; and

(3) U.S. imports increased.

Table 24.--Ball and roller bearings and parts: U.S. producers' shipments, by major types, 1974-84

(In millions of dollars)

Year	Ball bearings, complete	Tapered roller bearings, cups, and cones	Roller bearings, complete	Mounted bearings, except plain	Parts and components, sold separately	Total
1974	624	583	363	175	200	1/ 1,950
1975	646	626	375	188	208	1/ 2,046
1976	655	684	427	200	212	1/ 2,195
1977	750	749	473	213	243	1/ 2,445
1978	910	843	511	224	292	2,780
1979	1,076	990	587	256	330	3,238
1980	1,179	914	603	259	307	3,262
1981	1,274	969	714	280	346	3,583
1982	1,071	695	595	240	290	2,891
1983	1,197	692	587	245	325	2,956
1984	1,377	880	680	298	393	3,627

1/ Data does not add to total because of the omission of small amounts of balls and rollers classified elsewhere.

Source: U.S. Department of Commerce, Current Industrial Reports, Antifriction Bearings, 1984.

Data obtained from the Commission's questionnaires (questionnaire shipment data covers approximately 85 percent of the domestic industry when compared with Commerce data) closely parallels Commerce's shipment data, as shown in the following tabulation:

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Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Ball bearings, complete	1,012	1,170	984	1,051	1,238	642	664
Tapered roller bearings	786	876	638	605	770	405	359
Roller bearings, complete	586	687	572	554	656	316	324
Mounted bearings	224	244	221	220	293	153	146
Components and parts of ball and roller bearings	158	158	109	115	155	83	83
Total	2,766	3,135	2,524	2,545	3,112	1,599	1,576

Note.--Because of rounding, figures may not add to the totals shown.

U.S. imports

According to data obtained from the Commission's questionnaires, U.S. imports of ball and roller bearings increased from $252 million and $303 million in 1980 and 1981, respectively, to $384 million in 1983, and then to $632 million in 1984 (table 25). Comparing January-June 1984 with January-June 1985, imports of ball and roller bearings increased 48 percent, from $218 million to $323 million. This large increase of imports in 1984 and during January-June 1985 can be attributed largely to greater price competition by importers in high-volume bearing lines. Ball bearings, complete, accounted for 44 percent ($279 million) of all bearing imports in 1984 compared with 62 percent ($155 million) in 1980. Imports of tapered roller bearings, cups, and cones, increased 178 percent during 1980-84, from $51 million to $142 million, rising from 20 percent in 1980 to 22 percent of all bearing imports in 1984.

According to data obtained from the Commission's questionnaires, U.S. imports by ball and roller bearing producers operating in the United States accounted for 56 percent ($354 million) of the total U.S. imports of bearings in 1984 compared with 41 percent ($197 million) in 1980, or by 80 percent. Data provided by respondents indicate that 12 ball bearing producers and 7 roller bearing producers have started to import, as a response to increased competition in the U.S. market from foreign-made ball and roller bearings, components, and parts. Increased imports into the United States can also be attributed to the rise of joint ventures between U.S. and foreign bearing producers. By forming a joint venture with a U.S. producer, foreign manufacturers export bearing products to the United States and sell these products under the U.S. producers' label. 1/ The large increase in imports as

1/ Industry interviews.

Table 25.--Ball and roller bearings and parts: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84, January-June 1984, and January-June 1985

Item	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985	Percentage change 1984 from 1980
	Million dollars							
Ball and roller bearings, and parts:								
Producers' shipments:								
Questionnaire	2,767	3,135	2,525	2,546	3,112	1,599	1,576	12.5
Census	3,262	3,583	2,891	2,956	3,627	1/ 1,859	1/ 1,830	11.2
Exports:								
Questionnaire	205	212	161	135	178	83	93	-13.2
Census	369	382	310	253	331	164	161	-10.3
Imports:								
Questionnaire	252	303	288	384	632	218	323	150.8
Census	489	485	454	423	628	284	336	28.4
Apparent consumption:								
Questionnaire	2,814	3,226	2,652	2,795	3,566	1,734	1,806	26.7
Census	3,382	3,686	3,035	3,126	3,924	1/ 1,979	1/ 2,005	16.0
Ratio of imports to consumption:								
Questionnaire	9.0	9.4	10.9	13.7	17.7	12.6	17.9	96.7
Census	14.5	13.2	15.0	13.5	16.0	1/ 14.4	1/ 16.8	10.3
Ball bearings, complete:								
Producers' shipments:								
Questionnaire	1,012	1,170	984	1,051	1,238	642	664	22.3
Census	1,179	1,274	1,071	1,107	1,377	1/ 714	1/ 739	16.8
Exports:								
Questionnaire	42	52	39	34	44	19	20	4.8
Census	94	102	77	64	81	42	37	13.8
Imports:								
Questionnaire	155	180	149	178	279	113	141	80.0
Census	263	254	223	210	295	137	159	12.2
Apparent consumption:								
Questionnaire	1,125	1,298	1,104	1,195	1,473	736	785	30.9
Census	1,348	1,426	1,217	1,253	1,591	1/ 809	1/ 861	18.0
Ratio of imports to consumption:								
Questionnaire	13.8	13.9	13.5	14.9	18.9	15.4	18.0	36.9
Census	19.5	17.8	18.3	16.8	18.5	1/ 16.9	1/ 18.5	-5.1
Tapered roller bearings, cups, and cones:								
Producers' shipments:								
Questionnaire	786	876	638	605	770	405	359	-2.0
Census	914	969	695	692	880	1/ 462	1/ 410	-3.7
Exports:								
Questionnaire	98	92	59	46	63	30	33	-33.7
Census	152	157	119	91	134	65	62	-11.8
Imports:								
Questionnaire	51	69	75	89	142	70	122	178.4
Census	66	73	88	97	158	68	80	139.4
Apparent consumption:								
Questionnaire	739	853	654	648	849	445	448	14.9
Census	828	885	664	698	904	1/ 465	1/ 428	9.2
Ratio of imports to consumption:								
Questionnaire	6.9	8.1	11.5	13.7	16.7	15.7	27.2	142.0
Census	8.0	8.3	13.3	13.9	17.5	1/ 14.6	1/ 18.7	118.8

See footnote at end of table.

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Table 25.--Ball and roller bearings and parts: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84, January-June 1984, and January-June 1985--Continued

Item	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985	Percentage change 1984 from 1980
	Million dollars							
Other roller bearings, complete:								
Producers' shipments:								
Questionnaire	586	687	572	554	656	316	324	11.9
Census	603	714	595	587	680	1/ 328	1/ 336	12.8
Exports:								
Questionnaire	32	36	33	32	40	20	24	25.0
Census	79	76	71	63	70	34	40	-11.4
Imports:								
Questionnaire	33	36	48	100	180	19	45	445.5
Census	107	106	105	77	109	48	61	1.9
Apparent consumption:								
Questionnaire	587	687	587	622	796	315	345	35.6
Census	631	744	629	601	719	1/ 342	1/ 357	13.9
Ratio of imports to consumption:								
Questionnaire	5.6	5.2	8.2	16.1	22.6	6.0	13.0	303.6
Census	17.0	14.2	16.7	12.8	15.2	1/ 14.0	1/ 17.1	-10.6
Mounted ball and roller bearings, except plain:								
Producers' shipments:								
Questionnaire	224	244	221	220	293	153	145	30.8
Census	259	280	240	245	298	1/ 156	1/ 146	15.1
Exports:								
Questionnaire	9	8	8	7	9	3	4	0
Census	20	23	22	19	23	12	11	15.0
Imports:								
Questionnaire	8	8	7	9	13	7	4	62.5
Census	7	7	6	9	11	5	5	57.1
Apparent consumption:								
Questionnaire	223	244	220	222	297	157	146	33.2
Census	246	264	224	235	300	1/ 149	1/ 140	30.0
Ratio of imports to consumption:								
Questionnaire	3.6	3.3	3.2	4.1	4.4	4.5	2.7	22.2
Census	2.8	2.7	2.7	3.8	3.7	1/ 3.4	1/ 3.6	32.1
Parts and components for ball and roller bearings:								
Producers' shipments:								
Questionnaire	158	158	109	115	155	83	86	2.0
Census	307	346	290	325	393	1/ 202	1/ 243	28.0
Exports:								
Questionnaire 1/	11	10	6	6	8	4	4	-63.6
Census	24	24	22	16	22	11	12	-8.3
Imports:								
Questionnaire	6	10	9	7	19	9	11	50.0
Census	45	45	32	30	55	27	31	22.2
Apparent consumption:								
Questionnaire	153	158	112	116	166	88	90	8.5
Census	328	367	300	339	426	218	262	30.0
Ratio of imports to consumption:								
Questionnaire	3.9	6.3	8.0	6.0	11.4	10.2	12.2	192.3
Census	13.7	12.3	10.7	8.8	12.9	12.4	11.8	-5.8

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: All data were provided by (or derived from) questionnaires provided to the U.S. International Trade Commission by U.S. producers and importers of ball and roller bearings and parts, except for data provided or derived from official statistics of the Bureau of the Census, U.S. Department of Commerce (identified in table as "Census").

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reported by respondents to the Commission's questionnaires during 1980-84 is somewhat misleading since reporting of the earlier years of the survey period was incomplete. For this reason, both questionnaire and official statistics are presented in table 25. The increase in imports based on official U.S. statistics is less than that reported by questionnaire respondents. Such imports increased from $489 million to $628 million during 1980-84.

The increasing import trend occurring during 1983-84 appears to be continuing in 1985, based on the fact that the January-June 1985 value of U.S. imports of $336 million represents an increase of 18 percent over the $284 million recorded during January-June 1984. Japan, the principal supplier of ball and roller bearing imports, increased its share of U.S. imports of such products, from 38 percent and 42 percent in 1980 and 1982, respectively, to 47 percent in 1984. West Germany was the second leading supplier, but its share of the U.S. import market of ball and roller bearings declined from 17 percent in 1982 to 16 percent in 1984. Other significant suppliers included Canada and Singapore, supplying 10 and 5 percent, respectively, of all U.S. bearing imports in 1984.

U.S. consumption

Data obtained from the Commission's questionnaires show apparent U.S. consumption of ball and roller bearings and parts decreased from $2.8 billion in 1980 to $2.7 billion in 1982 and then rose to $3.6 billion in 1984 (table 25). During 1980-84, roller bearings, complete, showed the largest percentage increase in apparent consumption, rising from $587 million in 1980 to $796 million in 1984, representing an increase of more than 35 percent (table 25). Apparent consumption of parts and components for ball and roller bearings increased 8 percent, from $153 million in 1980 to $166 million in 1984. A contributing factor to this significant increase of consumption for bearing parts was the increase in the bearing replacement market. As machinery users repaired machinery instead of purchasing new machinery, consumption of replacement bearings increased. Apparent U.S. consumption of other major types of bearings also increased during 1980-84. Ball bearings, complete, increased by 31 percent; mounted ball and roller bearings by 33 percent; and tapered roller bearings by 6 percent. The increase in consumption in 1984, for all types of ball and roller bearings, was in response to increased demand by producers in the automotive, construction, metalworking, and aircraft industries. Apparent consumption figures derived from respondents to the Commission's questionnaire during 1980-84 are somewhat misleading, since reporting of the earlier years of certain items by the survey was incomplete.

The potential effect of imports of products containing bearings on the U.S. ball and roller bearing industry

The following analysis is designed to estimate the impact on the U.S. market for domestically produced ball and roller bearings resulting from imports of bearings shipped separately and those incorporated into imported finished products. The major product categories containing bearings are the

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following: 1/ construction machinery, 2/ farm machinery, 3/ motor-vehicle parts, 4/ passenger autos, 5/ and engines and parts. 6/

For the purpose of this analysis, it is assumed that displacement of bearings occurs at a point where imports of bearings (whether imported separately or imported as part of a finished product) exceeds a certain level relative to U.S. bearing production. It is interesting to note that the ratio of imports of bearings to domestic production of bearings maintained a near constant relationship during 1978-83. This ratio was therefore chosen as the historical or base relationship from which to calculate potential displacement, 7/ resulting from sharp increases in imports during 1984 and January-June 1985.

The estimates of the potential displacement during 1978-84 are based on the following assumptions:

1. The bearings contained in the imports in the five major bearing-consuming product categories do not contain U.S.-produced bearings; and

2. Since the data are in terms of value, the share of the dollar value of bearings used in the imported product to the total cost of the imported product will remain constant throughout the period.

To determine the portion of the above-mentioned machinery and equipment that contains ball and roller bearings, appropriate industry sources were consulted. According to these sources, in a typical piece of equipment or machinery, the average percentage cost of the ball and roller bearings to the total imported value of the end products based on dollar value during 1978-85 are shown in the following tabulation:

1/ The five major bearing-consuming product categories were selected based on consumption data published in the 1982 Census of Manufactures, U.S. Department of Commerce, Bureau of the Census.

2/ The TSUS items included are 664.06-664.12 and 692.35.

3/ The TSUS items included are 666.00, 666.10, and 692.34.

4/ The motor-vehicle parts and accessories industry comprises approximately 250 TSUS numbers; for simplicity, the bulk of these items fall within the Standard Industrial Code (SIC) 3714, Motor Vehicles Parts and Accessories.

5/ The items included are 692.11; 692.30; 692.1005; 692.1010; 692.1015; and 692.1030, of the TSUSA.

6/ The current TSUSA items included are 660.5610; 660.5800; 660.5920; 660.5940; and 660.6100.

7/ The estimates must be interpreted as upperbound or overestimates of the domestic bearings being displaced because: (1) lower cost foreign bearings encourage industrial consumers of bearings to use a greater number of total bearings and; (2) lower cost foreign bearings also reduce the cost of the final product, thus likely resulting in more sales of the final product and, consequently, a greater number of bearings being utilized If faced with higher priced bearings, industrial consumers would probably use fewer bearings, try to use substitutes, or make design changes in the product.

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Product category	Percent of bearing content to total imported value
Construction machinery	1.5
Farm machinery	1.5
Motor-vehicle parts	1.0
Passenger autos	.5
Aircraft engines and parts	1.0

By multiplying each of the foregoing percentages by the appropriate yearly import values for the specified five product categories (table 26), the potential value of bearings contained in U.S. imports of these products are calculated (table 27).

The dollar value of imported bearings contained in the products of the five major bearing-consuming product categories totaled $2.14 billion from 1978 to 1985 (table 27) and the value of bearings imported separately amounted to $4.09 billion (derived from table 28). Therefore, estimated bearing imports totaled $6.14 billion during 1978-85. To calculate the level of potential displacement, the averaged sums of total U.S. imports of ball and roller bearings plus the averaged estimated value of U.S. bearings contained in the five major bearing-consuming product categories were divided by averaged total U.S. bearing shipments. During 1978-83, the average level of bearing imports, both those contained in "downstream" products and those imported separately, as a share of domestic shipments, was 22 percent fluctuating within a narrow range between 21 percent and 24 percent. 1/ During 1984-85, the average jumped 6 percentage points to 28 percent. This 6 percentage point difference represents the potential displacement. In this case, the 6 percentage points represent $129 million ($2.124 billion x .06) displacement. If the relationships were calculated in 1978 constant dollars, the total potential displacement would have amounted to $92 million. (See table 28 for comparison of current and constant dollars.)

1/ The value of bearings (both those imported separately or contained in a "downstream" product) as a share of total U.S. bearing shipments during 1978-83 is used as a measure of historic relationship with which to gauge the displacement effect of the large import increase during 1984-85.

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Table 26.--U.S. imports for consumption of the 5 major ball and roller bearing-consuming product categories, 1978-85

(In millions of dollars)

Item	1978	1979	1980	1981	1982	1983	1984	1985 1/
Construction machinery	1,100	1,131	1,186	1,669	1,384	1,200	2,065	2,642
Farm machinery	559	782	1,782	1,573	1,207	1,388	1,810	1,770
Motor-vehicle parts	7,409	8,351	8,835	10,618	10,235	10,962	15,640	18,432
Passenger autos	14,071	14,852	16,675	17,645	20,180	23,394	29,264	34,056
Aircraft engines and parts	468	549	760	1,053	813	620	873	1,144
Total	23,607	25,665	29,238	32,558	33,819	37,564	49,652	58,044
Converted to constant dollars 2/	23,607	22,712	22,319	22,454	22,697	24,877	32,242	37,448

1/ Estimated by the staff of the U.S. International Trade Commission based on the value of imports for January-June 1985.

2/ Constant year values were calculated in 1978 dollars by deflating the absolute dollar values during 1979-85 by implicit industrial goods price index deflators. For implicit industrial goods price index deflators, see International Financial Statistics, International Monetary Fund, August 1985, pp. 486-487.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

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Table 27.--Estimated value of ball and roller bearings contained in U.S. imports of the 5 major ball and roller bearing-consuming product categories, 1978-85

(In millions of dollars)

Item	1978	1979	1980	1981	1982	1983	1984	1985 1/
Construction machinery	17	17	18	25	21	18	31	40
Farm machinery	7	10	22	20	15	17	23	26
Motor-vehicle parts	74	83	88	106	102	110	156	184
Passenger autos	70	74	83	88	101	117	146	170
Aircraft engines and parts	5	5	8	11	8	6	9	11
Total	173	189	219	250	247	268	365	431
Converted to constant dollars 2/	173	167	167	172	166	177	237	3/ 278

1/ Estimated by the staff of the U.S. International Trade Commission based on the value of imports for January-June 1985.

2/ Constant year values were calculated in 1978 dollars by deflating the absolute dollar values in 1979-85 by implicit industrial goods price index deflators. For implicit industrial goods price index deflators, see International Financial Statistics, International Monetary Fund, August 1985, pp. 486-487.

3/ The June 1985 deflator was used. See International Financial Statistics, International Monetary Fund.

Source: Derived by the staff of the U.S. International Trade Commission.

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Table 28.--Total U.S. imports of ball and roller bearings, total estimated imports of ball and roller bearings contained in the machinery and equipment imported into the United States in the 5 major bearing-consuming product categories, and U.S. domestic shipments of ball and roller bearings, 1978-85

(In millions of dollars)

Year	U.S. imports		Other imports 1/		U.S. shipments	
	Current	Constant 2/	Current	Constant 2/	Current	Constant 2/
1978	398	398	173	173	2,780	2,780
1979	486	430	189	167	3,280	2,865
1980	489	373	219	167	3,262	2,490
1981	485	334	250	172	3,583	2,471
1982	460	309	247	166	2,891	1,940
1983	423	280	268	177	2,956	1,958
Total	2,741	2,124	1,346	1,022	18,752	14,504
1984	628	407	365	237	3,627	2,355
1985	3/ 630	4/ 406	3/ 431	4/ 278	5/ 3,692	4/ 2,382
Total	1,258	813	796	515	7,319	4,737

1/ Estimates based on industry sources' percentages as shown on p. 79.

2/ Constant year values were calculated in 1978 dollars by deflating the absolute dollar values during 1979-85 by implicit industrial goods price index deflators. For implicit industrial goods price index deflators, see International Financial Statistics, International Monetary Fund, August 1985, pp. 486-487.

3/ Estimated 1985 figures were calculated by dividing the August total by 8, multiplying this value by 4, and adding the resultant sum to the August 1985 figure to obtain an estimated 1985 total value of imports.

4/ The June 1985 deflator was used. See International Financial Statistics, International Monetary Fund, August 1985, p. 487.

5/ Estimated by the staff of the U.S. International Trade Commission.

Source: Derived by the staff of the U.S. International Trade Commission.

Based on 1982 dollars and 1983 production/employment relationships for ball and roller bearings, each $129 million in potential displacement translates into an estimated $265 million in lost production opportunities in all sectors of the U.S. economy and a potential loss of 4,725 job opportunities. 1/ In the ball and roller bearing sector alone, 2/ approximately $123 million in potential production opportunities were lost, along with a potential loss of 2,198 jobs not created. The estimated effects on all U.S. industry, assuming lost production opportunities of $129 million, is summarized in table 29.

1/ These estimates are based on the 1983 Bureau of Labor Statistics input-output model.

2/ This industry sector includes more than ball and roller bearings, for example, pumps and pumping equipment and fans.

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Table 29.--Ball and roller bearings: Effects of $129 million loss in U.S. demand of ball and roller bearings on the output and employment in all U.S. industry sectors

Industry sector	Employment lost	Output lost
	No. of employees	Million dollars
Ball and roller bearings	2,198	123
Other manufacturing	1,375	127
Other	1,152	15
Total	4,725	265

Source: Derived by the staff of the U.S. International Trade Commission based upon the 1983 Bureau of Labor Statistics input-output model.

Major foreign markets for ball and roller bearings

In 1983, the following 10 countries were the leading importers of ball and roller bearings and parts (value of imports in 1,000 dollars indicated in parentheses): the United States ($354,240), West Germany ($318,255), France ($173,256), Italy ($165,488), the United Kingdom ($133,309), Canada ($127,008), Sweden ($76,856), Belgium-Luxembourg ($72,078), Spain ($66,497), the Netherlands ($54,431), Singapore ($52,025), and the Republic of South Africa ($42,078). 1/ Of these 11 countries (excluding the United States), all but Italy, Sweden, Spain, the Netherlands, and Singapore were also the leading foreign markets for the United States in 1983. Other important markets for the United States that year were Australia and the Latin American markets of Mexico, Brazil, and Venezuela.

Table 30 shows the level of imports of ball and roller bearings by certain major importing countries and the U.S. share of those imports. Data are presented for 1970, 1975, and 1983 and average annual growth rates of imports are shown for 1970-75, 1975-83, and 1970-33.

During 1970-83, all of these major importing countries, except for China, increased their imports of ball and roller bearings; such imports in the aggregate, rose from $389 million in 1970 to $1,457 million in 1983. During the same period, however, the U.S. industry's share of these markets dropped from 20 to 14 percent. Canada and Mexico did remain major markets for the United States during 1970-83; exports increased significantly and the U.S. market share rose from 65 to 67 percent for Canada and from 50 to 72 percent for Mexico. Canada remained by far the largest market for U.S. bearings, influenced mainly by the duty-free treatment provided in the U.S.-Canadian Automotive Products Agreements.

1/ Based on export data provided in, National Technical Information Service, U.S. Department of Commerce, 1970-83 Market Share Reports. On an import value basis, these values would be somewhat higher, taking into account transportation, insurance, and duty costs.

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Table 30.--Ball and roller bearings and parts: Foreign country imports and U.S. share of imports, 1970, 1975, and 1983 1/

Country	1970	U.S. share	1975	U.S. share	1983	U.S. share	Average annual growth rate of imports for--		
							1970-75	1975-83	1970-83
	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	Million dollars	Percent	
Canada	45	65	93	62	127	67	16	4	8
Brazil	15	21	72	15	34	20	37	-9	6
Mexico	14	50	33	45	28	72	19	-2	5
Belgium	52	17	47	16	72	12	17	20	3
France	21	17	130	10	173	7	20	4	18
West Germany	61	9	175	4	318	6	24	8	14
Italy	41	9	99	7	165	2	19	7	11
Netherlands	20	13	35	13	54	12	12	6	8
United Kingdom	34	29	90	15	133	11	22	5	11
Sweden	12	8	57	3	77	1	37	4	15
Switzerland	17	4	36	2	42	3	16	2	7
Spain	23	6	48	8	66	4	16	4	8
China	17	0	27	2/	11	2	10	-11	-3
Japan	4	65	9	63	11	60	18	3	8
India	7	20	11	14	39	10	9	17	14
Singapore	2	37	24	9	52	10	65	10	28
Korea	1	47	6	8	32	10	43	23	31
Taiwan	3	7	3/	3/	23	11	3/	3/	17

1/ Based on export data provided in Market Share Reports, National Technical Information Services, U.S. Department of Commerce, 1970-83. On an import value basis, these values would be somewhat higher, taking into account transportation, insurance, and duty costs.

2/ Less than 0.5 percent.

3/ Not available.

Source: Market Share Reports, National Technical Information Service, U.S. Department of Commerce, 1970-83.

Exports from Singapore grew from a negligible amount in 1973 to $113 million in 1983 and adversely affected the market shares of traditional suppliers. Bearings produced in Singapore, largely by Japanese-owned firms, were exported principally to Japan and the United States, with other important markets including Malaysia, Thailand, and West Germany. During 1980-83, bearing exports to the United States rose from $14.8 million to $18.4 million, accounting for 16 percent of total exports in each year, whereas exports to Japan increased from $19.2 million to $32.2 million and rose from 19 percent of total exports in 1980 to 32 percent of total exports in 1983.

Major consumers of ball and roller bearings are the automotive, construction, farm equipment, and aircraft industries. U.S. bearing producers' sales are affected both by worldwide demand for these products and by the country producing the component or finished product containing the bearing. U.S. imports of the components and finished products of these four consuming industries have increased significantly during 1978-85, and, as indicated on pages 78-84 of this report, such increased imports are estimated to have replaced a significant amount of U.S.-produced products, in as much as bearing production often occurred in or near the country in which the component or product was manufactured.

Table 31 shows the major bearing-consuming sectors of selected countries that manufacture the products that are the principal bearing consumers. Included are the annual rates of growth (or decline) during 1973 and 1982, for metal products; miscellaneous machinery, including agricultural machinery and equipment, metal- and woodworking machinery, and other special industrial machinery and equipment; and transportation equipment. The largest growth rates occurred in the developing nations of Mexico, Venezuela, Korea, and Singapore. Although these markets are still relatively small compared with such major consuming countries as the United States, West Germany, and Japan, these developing markets may offer potential growth. Data in this table indicate declines for the United States in the metal products and transportation equipment sectors and slow growth for West Germany and Japan in all three of the sectors identified.

Conditions of Competition Between the U.S. and Foreign Industries in Domestic and Foreign Markets

In recent years, the U.S. bearing industry has experienced increased foreign competition both in the United States and other markets. This competition has come not only from traditional competition in Japan and West Germany, but also from newer entries such as Singapore, Taiwan, Korea, China, Romania, Hungary, and Yugoslavia. These new competitors that were identified by U.S. producers responding to the Commission's questionnaire, offered a broad range of products including ball bearings, complete; cups and cone and roller assemblies for tapered roller bearings; spherical roller bearings; and mounted ball bearings. Among those countries identified in the questionnaire, Romania offered the widest range of products, and all of the above listed Eastern bloc countries sold tapered roller bearings.

U.S. purchasers of bearings responding to the Commission's questionnaire evaluated the importance they attached to various purchasing factors. The following factors, considered extremely important, are listed depending on the

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Table 31.--Indexes of production for major bearing consuming sectors, selected countries, 1973 and 1982

(Indexes, 1975=100)

Countries	Metal products 1/			Machinery n.e.c. 2/			Transportation equipment		
	1973	1982	Percentage change 2/	1973	1982	Percentage change 3/	1973	1982	Percentage change 3/
United States	114	104	-1.0	107	119	1.2	122	108	-1.3
Canada	102	95	-0.8	89	117	3.1	99	91	-0.9
Brazil 4/	87	4/ 140	4/ 5.4	84	101	2.1	84	100	2.0
Mexico 5/	91	144	5.9	68	181	13.0	74	167	10.7
Venezuela	95	202	8.7	86	256	12.9	76	212	12.1
Belgium	94	108	1.6	90	94	0.6	97	154	5.3
France	109	122	1.2	98	112	1.5	107	119	1.2
W. Germany	112	113	0.1	105	116	1.1	108	124	1.5
Italy	-	-	-	96	140	4.3	109	137	2.6
Netherlands	98	107	1.0	6/ 99	6/ 105	6/ 0.7	107	96	-1.2
United Kingdom	112	73	-4.6	96	87	-1.1	111	83	-3.2
Sweden	94	94	0.0	88	84	-0.5	92	97	0.6
Switzerland 7/	133	7/ 113	7/ -1.8	8/ 105	8/ 97	8/ -0.9	-	-	-
Spain	101	106	0.5	94	90	-0.5	95	96	0.1
Japan	133	135	0.2	128	159	2.4	103	129	2.5
India	86	127	4.4	90	150	5.8	103	134	3.0
Singapore	112	128	1.5	69	213	13.3	71	183	11.1
Korea	38	376	29.0	82	259	13.6	33	352	30.1
Australia	125	83	-4.4	109	84	-2.9	101	91	-1.2
Republic of Korea	90	134	4.5	86	126	4.3	100	128	2.8

1/ Includes cutlery, handtools, and general hardware; furniture and fixtures; structural steel products; and manufactures of fabricated metal products, except machinery and equipment not elsewhere classified.

2/ Includes manufacture of agricultural machinery and special industrial machinery and equipment; metal- and woodworking machinery, other and accounting machinery and other manufactures of machinery and equipment, except electrical, not elsewhere classified.

3/ Annual growth rate, 1973-82.

4/ Includes metal products, nonferrous metals, and iron and steel.

5/ Data are for 1973-81.

6/ Data are for 1975-82.

7/ Includes iron and steel, nonferrous metals, and metal products.

8/ Includes electrical machinery and transportation equipment.

Source: Yearbook of Industrial Statistics, the United Nations, 1982.

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number of times they were mentioned: (1) quality, durability, and reliability of product; (2) reliability of the suppliers; (3) price; (4) availability of parts; and (5) service and technical features and performance characteristics. Since a number of U.S. and foreign bearing producers have established reputations, especially for product reliability, price becomes a critical factor that has a significant influence on sales.

U.S. bearing producers reported in the Commission's questionnaire that Japanese-produced and West German-produced bearings have an overall competitive advantage over U.S.-produced bearings in the United States and other markets. However, producers reported that more of the related competitive factors such as availability of product on short notice, reliability of factors in judging competitiveness suppliers, service, technical features and performance characteristics, and engineering and design assistance favored U.S. suppliers. Their evaluations of the overall competitive advantage, in these cases, were strongly influenced by the importance of price, exchange rates, and financial terms.

Data from the Commission's questionnaire indicates that the prices for U.S. produced bearings are higher than the prices for the bulk of imported bearings sold in the U.S. market. The common element throughout these price data was the movement of all bearing prices with the business cycle. Prices rose from 1980 prior to the recession and then fell afterwards. Although all prices tended to recover when the recession ended, imported bearing prices exhibited a mixed pattern. Some of these prices rose above the 1980 levels, whereas others fell below such levels.

Exchange rates between the currencies of the United States and foreign countries that are major bearing competitors have had an important effect on bearing prices in recent years. From January 1980 to March 1985, the U.S. dollar 1/ appreciated 29 percent relative to the Japanese yen. With respect to the West German mark, the U.S. dollar appreciated 91 percent, in real terms, during the same period. The price advantage that these and other foreign products enjoy in the United States applies to those products that are produced using inputs that are priced in foreign currency. The bulk of the inputs used in the production of bearings, such as labor and steel, are purchased from local sources in these competitors' countries.

U.S. producers indicated in the Commission's questionnaire that increased competition had led them to respond as follows: (1) lowered or held prices at current levels to maintain market share, (2) implemented cost-reduction efforts, (3) improved quality of the product, (4) cut back production, and (5) imported bearings, bearing components, or parts. The following are reasons cited for taking little or no action: (1) lack of capital funds, (2) moved to offshore facilities, or (3) switched to other marketing channels. Table presentations covering the competitive assessments reported in the Commission's questionnaire appear in appendix I.

1/ The U.S. dollar as measured on a real basis.

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Competitive assessment of U.S.- and foreign-produced bearings in U.S. and foreign markets

The Commission's questionnaire asked producers of ball and roller bearings and parts to assess the competitiveness of U.S.-produced and foreign-produced ball and roller bearings and parts in the United States and other markets. In addition, U.S. importers were asked the same questions with respect to the U.S. market. It should be noted that U.S. producers, or their affiliates, are the principal U.S. importers; such imports entered by these U.S. companies accounted for 56 percent of the total U.S. imports of ball and roller bearings and parts in 1984. This analysis will emphasize the competitive assessment among U.S.-produced, Japanese-produced, and West German-produced bearings. The principal comparisons were provided to the Commission in its questionnaires. However, limited responses were received concerning the bearings produced by Taiwan, Romania, Canada, Switzerland, Italy, China, the United Kingdom, Yugoslavia, Hungary, and France; these competitive assessments will be referred to in the text.

In summary, both U.S. bearing producers and U.S. importers indicated that Japanese and West German bearing producers had the overall competitive advantage over U.S. bearing producers in the United States. Furthermore, U.S. bearing producers also stated that a significant overall competitive advantage also belongs to Japan and West Germany in other world markets. Although U.S. producers indicated that Japanese-produced and West German-produced bearings have an overall competitive advantage, U.S. producers reported that more factors in judging competitiveness such as availability of product on short notice, reliability of suppliers, service, technical features and performance characteristics, and engineering and design assistance, favored them. Their evaluations of the overall competitive advantage, in these cases, were strongly influenced by the importance of price and the related factors of exchange rates and financial terms.

Competitive assessment by U.S. bearing producers in the U.S. market.--When U.S. producers examined the competitiveness in the U.S. market between themselves and Japanese producers, they gave overwhelmingly, in terms of frequency and degree of advantage, the overall competitive advantage to the Japanese. Specific attributes that favored Japanese producers were purchase price; exchange rates; quality, durability, and reliability of product; and financial terms. All other attributes such as availability of product on short notice; service; availability of parts; and reliability of supplier were judged to favor the U.S. producers (table I-1).

Again, U.S. producers indicated, by a wide margin, that the overall competitive advantage in the U.S. market between themselves and West German producers belonged to West Germany. Attributes reported to favor the West Germans were purchase price, exchange rate, and financial terms. Other factors were either judged to be the same or to the advantage of U.S. producers (table I-2).

Other foreign countries producing bearings whose products were competitively assessed by a small number of U.S. bearing producers in the U.S. market were Canada, Switzerland, Taiwan, Romania, and Italy. Canadian-produced ball bearings were assigned the overall competitive advantage based on the purchase price and exchange rate; whereas the availability of product on short

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notice; quality, durability, and reliability of product; reliability of supplier; service; and availability of parts favored U.S. producers.

Swiss-produced ball bearings were considered to have the competitive advantage based on all attributes except service, historical supplier relationship, and engineering and design assistance. In contrast, when compared with Taiwan, U.S. producers of ball bearings were judged to have an overall competitive advantage as well as the advantage in all other specific attributes, except in purchase price. Romanian-produced roller bearings received the overall competitive advantage based on purchase price; however; all of the other factors that were considered mostly favored U.S. producers, or, in a few cases, were rated the same. Bearings produced in Italy had the overall competitive advantage based on purchase price, exchange rates, and financial terms and service (roller bearings only).

Competitive assessment by U.S. bearing importers in the U.S market.--U.S. importers gave the overall competitive advantage in the U.S. market to Japanese suppliers, but by less of a margin then did U.S. producers. However, West German producers were given a large overall competitive advantage by U.S. importers as had been the case with the U.S. producers' evaluation. Similarly, this overall competitive advantage was judged to belong to imports from China, Romania, the United Kingdom, and Yugoslavia. The only overall competitive advantage for U.S. producers was provided by one respondent, comparing ball bearings with imports from Taiwan; Taiwan recovered only a price advantage, whereas, U.S. ball bearings enjoyed all other advantages, except for financial terms, which were considered equal.

U.S. importers indicated that with respect to Japanese ball bearings in the U.S. market, the overall competitive advantage went to Japanese producers (table I-3). U.S. suppliers were favored only in respect to the availability of product on short notice and historical supplier relationship. In regard to roller bearings, the Japanese were given the overall competitive advantage, whereas, U.S. producers were judged to have the competitive advantage in financial terms, availability of parts, and engineering and design assistance. Again, U.S. importers indicated, by an even wider margin than that given the Japanese, that the overall competitive advantage in the U.S. market between U.S. and West German producers belonged to West Germany. The only attribute reported to favor the U.S. producers were engineering and design assistance warranties and historical supplier relationship (ball bearings only), although a number of factors were considered the same (table I-4).

Other foreign countries producing bearings, whose products were competitively assessed by a small number of U.S. importers of bearings in the U.S. market, were China, Romania, Taiwan, the United Kingdom, Yugoslavia, and Hungary. Ball bearings produced in China were assigned the overall competitive advantage based on purchase price alone, whereas, roller bearings were judged better overall, based on purchase price and exchange rates, with technical features and performance characteristics considered the same. Romanian-produced ball and roller bearings were given the overall competitive advantage because of purchase price; however, one respondent indicated a preference for roller bearings based on most of the other attributes as well,

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although such a competitive advantage was considered slight. Taiwan-produced ball bearings were given the overall competitive disadvantage, with the only attributes favoring imports from Taiwan being purchase price and exchange rates. United Kingdom-produced bearings were rated as having an overall competitive advantage. Yugoslavian-produced and Hungarian-produced roller bearings were competitively assessed with an advantage over U.S.-produced bearings overall and in all attributes by one respondent.

Competitive assessment by U.S. bearing purchasers in the U.S. market.--OEM's and distributors that purchase ball and roller bearings and parts in the United States responded to the Commission's questionnaire with an evaluation of the importance they place on various purchasing factors. Those purchasing factors that were considered important, in order of the number of times they were so mentioned, are as follows: quality, durability, and reliability of the product; reliability of the suppliers; price; availability of parts; service and technical features and performance characteristics; availability of product on short notice; engineering and design assistance; and warranties. Most often cited as not at all important were foreign exchange rates. The complete response to the Commission's survey appears in table I-5.

Competitive assessment by U.S. bearing producers in foreign markets.--U.S. producers considered their competitive disadvantage greater in foreign markets than in the United States, according to responses to the Commission's questionnaire. Foreign competitors that were compared in other markets, in addition to producers from Japan and West Germany, were producers from Canada, France, Italy, and Taiwan. All but Japan and West Germany were evaluated based on a very small number of responses.

Japanese producers were given the overall competitive advantage in the foreign markets for all attributes, except for service, technical features and performance, and engineering and design assistance with respect to roller bearings. A few attributes were considered the same (table I-6).

U.S. producers indicated by an even wider margin than for Japan, that West Germany enjoyed a competitive advantage over the United States in other world markets. In fact, the United States was not given the competitive advantage with respect to any factors, and only quality, durability, and reliability of product; warranties; availability of parts (roller bearings only); and technical features and performance characteristics were rated the same (table I-7).

U.S. producers, based on limited responses, also assigned the overall competitive advantage, as well as most product-related attributes, to Canada, France, and Taiwan. Italy, although not receiving the overall competitive advantage, was considered to have the competitive advantage with respect to quality, durability, and reliability; reliability of supplier; service; historical supplier relationship; and technical features and performance characteristics.

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Price

U.S. bearing purchasers were asked to rank the factors that determined which bearing supplier they chose. Purchasers indicated that, among other factors, price was a major consideration in deciding upon a bearing supplier. The other important factors were the quality, durability, and reliability of the product; the reliability of the supplier; service; availability of parts; and the technical features and performance characteristics of the product.

In order to obtain information on price levels and trends, questionnaires were sent to U.S. producers, importers, and purchasers, requesting price data on the following six types of bearings:

1. Ball bearing, radial, 9mm and over but not over 30mm OD. Bearing specification: 8mm bore x 22mm OD, double shielded, ABEC1.

2. Ball bearing, radial, 30mm and over but not over 52mm OD. Bearing specification: 17mm bore x 40mm OD x 12mm wide, double shielded, ABEC1.

3. Ball bearing, radial, 52mm and over but not over 100mm OD. Bearing specification: 30mm bore x 62mm OD x 16mm wide, double shielded, ABEC1.

4. Cups for tapered roller bearings, under 4.5 inches cup OD. Cup specification: LM 11910.

5. Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches. Cone and roller assembly specification: LM 11949.

6. Needle roller bearings, bearing specification: B 2812.

In addition, U.S. producers and importers were asked to provide the price data by type of purchaser: OEM, and distributor. Also, U.S. producers were asked to provide additional price information on bearings imported by their firm and sold domestically. The data are summarized in tables 31 through 34.

Three facts are discernible from the weighted-average price information. First, prices of bearings sold to distributors exceed those of bearings sold to OEM's. Second, bearing prices rose from 1980 to 1982, and then fell after 1982. Third, although all prices fell below the 1982 level, the prices of imported bearings in June 1985 were below the level of prices in 1980, and the prices of U.S.-produced bearings show a mixed pattern. A discussion of specific price data follows.

U.S. producers' prices of U.S.-produced bearings and components.--Table 32 summarizes the weighted-average price data for U.S. producers of U.S.-produced bearings. These prices exhibit the characteristics noted in the preceding paragraph: the weighted-average price for sales to

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Table 32.--Certain ball and roller bearing components: Weighted-average net prices for the 3 largest sales of U.S. producers 1/ to OEM's and distributors, by products, 1980-84, and January-June 1985

Product	1980	1981	1982	1983	1984	January-June 1985
	OEM					
Ball bearing, radial, 9mm-30mm	$0.45	$0.80	$0.74	$0.55	$0.61	$0.63
Ball bearing, radial, 30mm-52mm	.99	.84	.88	.79	.78	.80
Ball bearing, radial, 52mm-100mm	1.79	1.89	.93	1.65	1.81	1.87
Cups for tapered roller bearings, under 4.5 inches cup O.D	.44	.50	.51	50	.50	.48
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	.92	1.02	1.11	1.10	1.07	1.02
Needle roller bearings	.96	1.09	1.14	1.22	1.24	1.27
	Wholesaler/distributor					
Ball bearing, radial, 9mm-30mm	$1.92	$1.75	$1.80	$1.99	$2.17	$2.29
Ball bearing, radial, 30mm-52mm	1.63	1.79	1.38	1.27	1.20	1.18
Ball bearing, radial, 52mm-100mm	2.77	2.83	2.21	2.11	2.23	1.93
Cups for tapered roller bearings, under 4.5 inches cup O.D	.71	.84	.86	.85	.86	.84
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	1.38	1.62	1.66	1.64	1.61	1.58
Needle roller bearings	1.58	1.76	1.92	2.01	2.09	2.19

1/ Prices are f.o.b. point of shipment, net of all discounts, allowances, and rebates of any kind.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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OEM's exceeds that for distributors; prices rose from 1980 to 1982 and then fell; and, June 1985 prices are, generally, higher than 1980 prices. Of the 12 types of bearings for which price data were obtained, 9 of the domestic prices of U.S.-produced bearings were higher in June 1985 than they were in 1980. The percentage increase in prices ranged from 4 to 39 percent. One-third of the price increases exceeded 30 percent, and 78 percent of the price increases exceeded 10 percent. Three prices were lower in June 1985 than they were in 1980. Ball bearings between 30mm to 52mm were sold to both OEM's and distributors, and ball bearings between 52mm and 100mm were sold to distributors. Prices of ball bearings 30mm and over but under 52mm that were sold to OEM's were 19 percent lower and prices of similar bearings sold to distributors were 28 percent lower than in 1980. Prices for ball bearings, 52mm and over but under 100mm, that were sold to distributors were 30 percent lower in June 1985 than they were during 1980.

U.S. producers' prices for imported bearings and components.--Table 33 summarizes the weighted-average price data for sales of imported bearings by U.S. producers. Generally, the weighted-average price of imported bearings sold to OEM's exceeds that for distributors. However, unlike U.S.-produced bearings, the price differential between bearings sold to OEM's and those sold to distributors is smaller. In addition, the price of 9mm to 30mm ball bearings is lower for those sold to distributors than for those sold to OEM's. Like other bearing prices, prices rose from 1980 to 1982 and then declined. These prices differ from the pattern described above in that the decline in prices from the 1982 levels has continued, beyond the level of prices are below those that existed in 1980. Of the 10 prices for which data were made available (no data were provided for needle roller bearings), 8 prices in June 1985 were below 1980 prices. The price decreases ranged from 2.5 percent to 43 percent, although five of the eight price decreases were below 7 percent. Prices to distributors of imported cups for tapered bearings and cone and roller assemblies for tapered roller bearings with the cage and rollers increased 15 and 9 percent, respectively.

A comparison of U.S. producers' prices for U.S.produced and imported bearings and components.--A comparison of prices for U.S.-produced bearings with those imported and sold by U.S. producers shows that imported bearings are lower in price than U.S.-produced bearings. Imported bearings sold to distributors reveal a greater degree and variability in the price advantage over U.S.-produced bearings.

U.S. importers prices for bearings and components.--Table 34 summarizes the weighted-average price data for U.S. importers of imported bearings. These data reveal a very mixed pattern. Although some prices rose from 1980 to 1982, some prices fell continuously from January 1980 to June 1985; others declined after 1982 and then rose to a level above those in 1980. Comparing the prices of imported bearings sold by U.S. producers to those of imported bearings sold by U.S. importers, the prices of ball bearings imported by U.S. importers generally exceed the prices of imported ball bearings sold by U.S. producers. Conversely, prices of imported tapered roller bearings sold by U.S. importers are lower than prices of imported tapered roller bearings sold by U.S. producers. Generally, imported bearings sold by U.S. importers are lower in price than U.S.-produced bearings sold by U.S. producers.

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Table 33.--Certain ball and roller bearings and components: Weighted-average net prices for the 3 largest sales of imported bearings and components by U.S. producers 1/ to OEM's and distributors, by products, 1980-84, and January-June 1985

Product	1980	1981	1982	1983	1984	January-June 1985
	OEM					
Ball bearing, radial, 9mm-30mm	$0.58	$0.65	$0.60	$0.48	$0.45	$0.45
Ball bearing, radial, 30mm-52mm	.72	.77	.78	.61	.67	.67
Ball bearing, radial, 52mm-100mm	1.48	1.85	1.50	1.33	1.20	1.18
Cups for tapered roller bearings, under 4.5 inches cup O.D	.40	.44	.46	.40	.40	.39
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	.83	.92	.97	.82	.77	.80
Needle roller bearings	-	-	-	-	-	-
	Wholesaler/distributor					
Ball bearing, radial, 9mm-30mm	$0.61	$0.62	$0.61	$0.41	$0.38	$0.35
Ball bearing, radial, 30mm-52mm	.74	.77	.79	.72	.73	.69
Ball bearing, radial, 52mm-100mm	2.17	2.53	2.26	1.86	2.77	2.03
Cups for tapered roller bearings, under 4.5 inches cup O.D	.46	.59	.52	.52	.52	.53
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	.92	1.10	1.08	1.09	1.08	1.00
Needle roller bearings	-	-	-	-	-	-

1/ Prices are f.o.b. point of shipment, net of all discounts, allowances, and rebates of any kind.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 34.--Certain ball and roller bearings and components: Weighted-average net prices for the 3 largest sales of imported bearings and components by U.S. importers 1/ to OEM's and wholesalers/distributors, by products, 1980-84, and January-June 1985

Product	1980	1981	1982	1983	1984	January-June 1985
	OEM					
Ball bearing, radial, 9mm-30mm	$0.74	$0.71	$0.63	$0.56	$0.53	$0.63
Ball bearing, radial, 30mm-52mm	.85	.84	.88	.73	.70	.67
Ball bearing, radial, 52mm-100mm	1.71	1.84	1.82	1.61	2.61	2.63
Cups for tapered roller bearings, under 4.5 inches cup O.D	.20	.20	.23	.32	.29	.17
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	1.07	.49	.38	.41	.40	.47
Needle roller bearings	-	-	-	-	-	-
	Wholesaler/distributor					
Ball bearing, radial, 9mm-30mm	$0.90	$1.30	$1.23	$1.00	$0.65	$0.72
Ball bearing, radial, 30mm-52mm	.80	.79	.86	.97	.81	1.25
Ball bearing, radial, 52mm-100mm	2.16	2.21	2.12	2.04	1.49	1.62
Cups for tapered roller bearings, under 4.5 inches cup O.D	-	-	-	2.50	.23	.37
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	-	-	-	1.00	.81	.86
Needle roller bearings	-	-	-	-	-	-

1/ Prices are f.o.b. point of shipment, net of all discounts, allowances, and rebates of any kind.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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U.S. purchasers' prices paid for U.S.-produced and foreign-produced bearings and components.--Table 35 summarizes the weighted-average price data for U.S. purchasers of bearings. Purchasers were asked to provide a breakdown by source of the bearings: domestic or foreign. These data reveal a mixed pattern. For both U.S.- and foreign-purchased bearings, three prices were higher in June 1985 compared with such prices in 1980, two were lower, and one unchanged. Moreover, in most cases, when the price of a U.S. bearing rose between January 1980 and June 1985, the price of the same bearing purchased from a foreign source fell. In comparison with U.S.-produced bearings, both foreign-and U.S.-purchased ball bearings were higher in price than the U.S.-produced bearing, whereas, the opposite occurred with respect to tapered roller bearings.

The common element throughout these price data was the movement of all bearing prices with the business cycle. Prices rose from 1980 prior to the recession and then fell afterwards. Whereas all prices tended to recover when the recession ended, imported prices exhibited a more mixed pattern. Some rose above the 1980 level, and others fell in comparison with the 1980 level. An additional factor not revealed by the price data contained in the tables is the influence of volume on prices. Depending on the volume of production, the price of a bearing, for instance, ball bearings 30mm and over but under 52mm, can vary from less than 39 cents to more than $4 per bearing. This price disparity suggests that even for narrowly defined products, bearing products may still be highly differentiated by other characteristics.

Exchange rate changes

It is generally believed that the appreciation of the U.S. dollar in foreign exchange markets has had an important effect on the competitive position of U.S. products. An increase in the value of the dollar relative to foreign currency lowers the dollar price of imports and, at the same time, raises the price of U.S. commodities in terms of foreign currency. The former effect leads to an increase in U.S. imports and the latter results in a decrease of U.S. exports.

Table 36 presents the nominal and real exchange rates (expressed in units of foreign currency per dollar and indexed in 1980) for the top seven countries that supply bearings to the United States. An increase in the index represents an appreciation of the dollar compared with the 1980 index and a reduction in the competitiveness of U.S. products. Since 1980, as illustrated in the upper half of the table, the value of the dollar has increased relative to the currencies of all major suppliers to the United States. The dollar has even increased in value relative to the Singapore dollar, which is pegged to a trade-weighted basket of currencies composed of its major trading partners. On a trade-weighted basis, the dollar has risen over 46 percent from January 1980 to March 1985, the latest period for which data are available.

Table 36 also illustrates that the dollar has risen not only in terms of nominal exchange rates, but its value has increased when measured by real exchange rates. Changes in real rates are equal to changes in the nominal rates adjusted for differences in inflation rates. The changes in real exchange rates provide an even clearer picture of the effect of exchange rate movements on the ability of U.S. goods to compete in price with foreign

Table 35.--Certain ball and roller bearings and components: Weighted-average net prices paid for the 3 largest purchases 1/ of U.S. and foreign bearings and components, by products, 1980-84, and January-June 1985

Product	1980	1981	1982	1983	1984	January-June 1985
	United States					
Ball bearing, radial, 9mm-30mm	$2.27	$3.13	$3.25	$3.51	$2.94	$2.51
Ball bearing, radial, 30mm-52mm	4.92	4.38	4.52	4.80	4.73	2.37
Ball bearing, radial, 52mm-100mm	6.43	4.79	5.48	5.37	5.40	6.56
Cups for tapered roller bearings, under 4.5 inches cup O.D	.87	.47	.77	.55	.40	.25
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	1.42	1.84	2.04	1.89	2.02	1.55
Needle roller bearings	.03	.03	.04	.04	.05	.03
	Foreign					
Ball bearing, radial, 9mm-30mm	$1.03	$3.69	$4.32	$4.43	$0.61	$0.45
Ball bearing, radial, 30mm-52mm	.87	1.90	1.68	2.22	2.35	2.05
Ball bearing, radial, 52mm-100mm	2.15	3.10	3.57	3.78	4.07	4.52
Cups for tapered roller bearings, under 4.5 inches cup O.D	.39	.45	.49	.44	.48	.51
Cone and roller assemblies for tapered roller bearings with the cage and rollers, under 4.5 inches	.84	1.07	1.13	1.08	.85	.80
Needle roller bearings	-	-	.68	.69	.66	.67

1/ Prices are net of all returns, discounts, allowances, and rebate purchases of any kind.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 36.--Indices of nominal, real, and trade-weighted exchange rates for major foreign suppliers of antifriction ball and roller bearings and parts, 1980-84 and January-March 1985

(1980=100)

Period	Japan	West Germany	Canada	Singapore	Italy	United Kingdom	France	Trade-weighted exchange rate
	Nominal-exchange-rate indices							
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	97.3	124.3	102.5	98.7	132.7	114.7	128.6	108.8
1982	109.9	133.5	105.5	99.9	157.9	132.9	155.5	120.2
1983	104.7	140.5	105.4	98.7	177.3	153.3	180.4	122.7
1984	104.8	156.6	110.8	99.6	205.2	174.1	206.8	131.1
1985 (Jan.-March)	113.6	179.1	115.8	104.6	236.0	208.6	235.7	146.2
	Real-exchange-rate indices							
1980	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1981	102.4	129.1	100.7	101.0	124.4	113.2	125.2	111.8
1982	113.9	139.7	99.2	104.0	134.8	128.1	143.6	124.3
1983	115.5	146.9	96.7	105.0	136.3	145.9	156.9	125.6
1984	117.8	166.7	101.6	108.0	148.4	164.6	174.7	134.8
1985 (Jan.-March)	128.9	191.2	105.9	115.0	164.9	195.0	195.8	150.7

Source: International Monetary Fund, International Financial Statistics.

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goods. Since 1980, the real value of the dollar has risen relative to the currencies of all major suppliers to the United States. In addition, the real appreciation of the dollar exceeds the nominal appreciation against the currencies of the two countries that accounted for over 60 percent of all bearing imports during the period. From January 1980 to March 1985, the dollar appreciated 14 percent, in nominal terms, relative to the Japanese yen. Yet on a real basis, the dollar appreciated 29 percent relative to the yen. A similar pattern existed with respect to the West German mark. The dollar appreciated 79 percent relative to the mark on a nominal basis, but 91 percent in real terms. The appreciation of the trade-weighted real exchange rate also exceeded the appreciation of the trade-weighted nominal exchange rate. The trade-weighted real exchange rate appreciated 51 percent between January 1980 and March 1985.

An effort was made to determine if the effect of changes in the real exchange rate from 1980 to 1984 were reflected in movements of exports and imports of bearings. All else constant, 1/ the appreciation of the dollar relative to a particular foreign country's currency should be associated with a decline in U.S. exports to that country and an increase in imports from that country. U.S. Department of Commerce data were available to construct Laspeyres import and export quantity indexes for trade between the U.S. and four countries. 2/ The indexes for imports and exports and the real-exchange-rate index (from table 36) for Japan, West Germany, Canada, and the United Kingdom are graphed in figures 5 through 8, respectively. Although it is not possible to infer anything about the relationship between the value of the dollar and U.S. bilateral trade, the diagrams do illustrate the importance of changes in demand on bearing trade. For those countries represented, imports of bearings declined after 1981 and, again for every country, imports began to recover or were increasing after 1983. These trends closely parallel the level of economic activity in the United States. Over the period, no country exhibited both a decline in U.S. exports to that country or an increase in U.S. imports from the country.

Technology

A number of studies indicate that the United States is equally competitive in its level of technology for manufacturing bearings compared with Japan, West Germany, and Sweden. However, the U.S. industry feels it is at the forefront of technology. 3/

1/ Of course, all else does not remain constant. Although the U.S. dollar may be appreciating relative to the British pound (and thereby reducing the competitiveness of U.S. products), the dollar at the same time may be appreciating to a greater extent relative to the Japanese yen. If so, U.S. imports of bearings from the United Kingdom may not increase, even if the dollar appreciated relative to the pound.

2/ The four products categories in the index are:

(i) ball bearings, non-radial type;
(ii) ball bearings with integral shafts;
(iii) antifriction balls and rollers; and
(iv) parts of ball bearings, other than balls.

3/ Statement on behalf of the Anti-Friction Bearing Manufacturers Association, Sept. 26, 1985.

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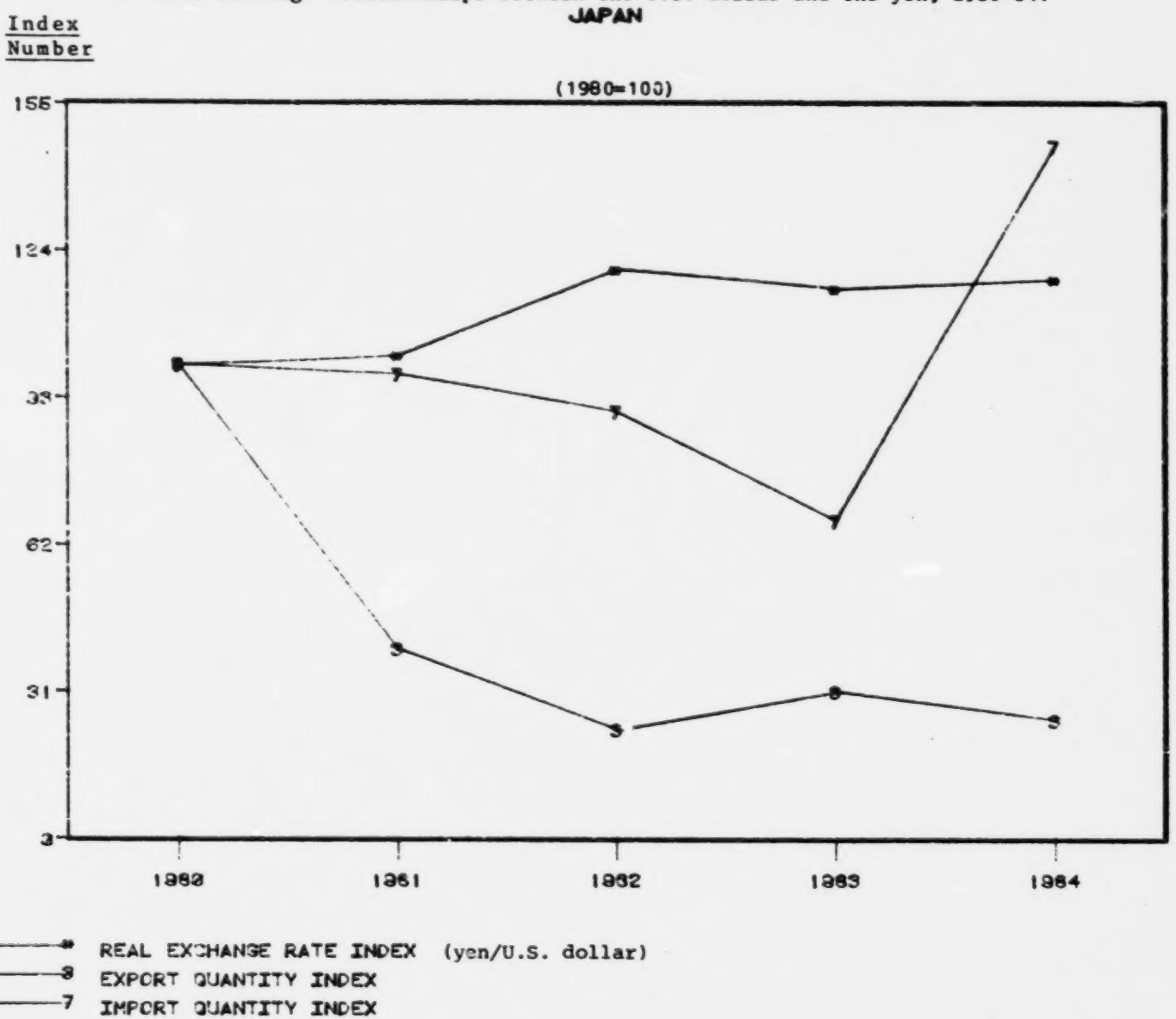
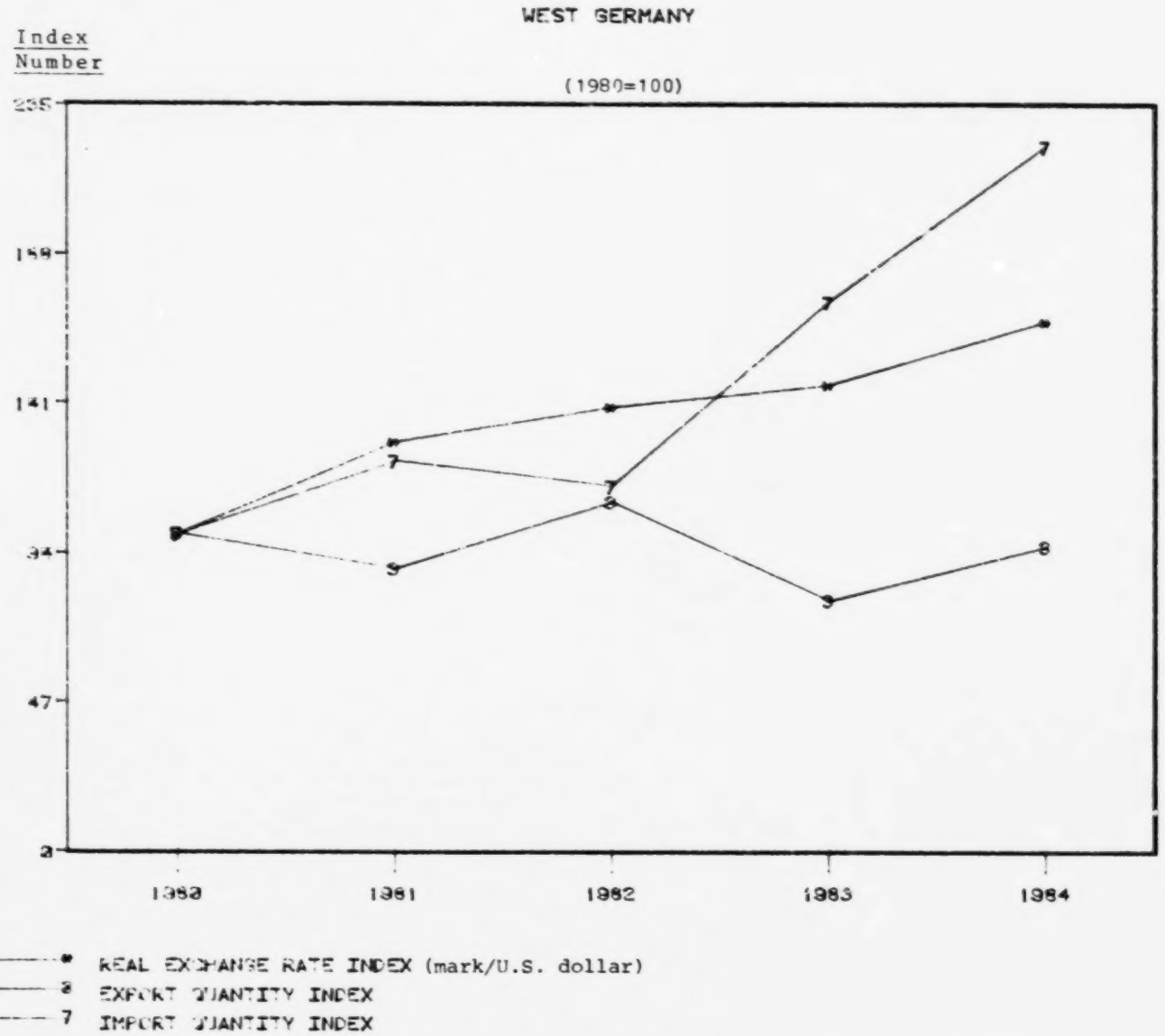
Figure 5.--Trends in U.S. exports and imports of ball and roller bearings compared with the real exchange relationships between the U.S. dollar and the yen, 1980-84.



Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 6.--Trends in U.S. exports and imports of ball and roller bearings compared with the real exchange relationships between the U.S. dollar and the German mark, 1980-84.



Source: Compiled from official statistics of the U.S. Department of Commerce.

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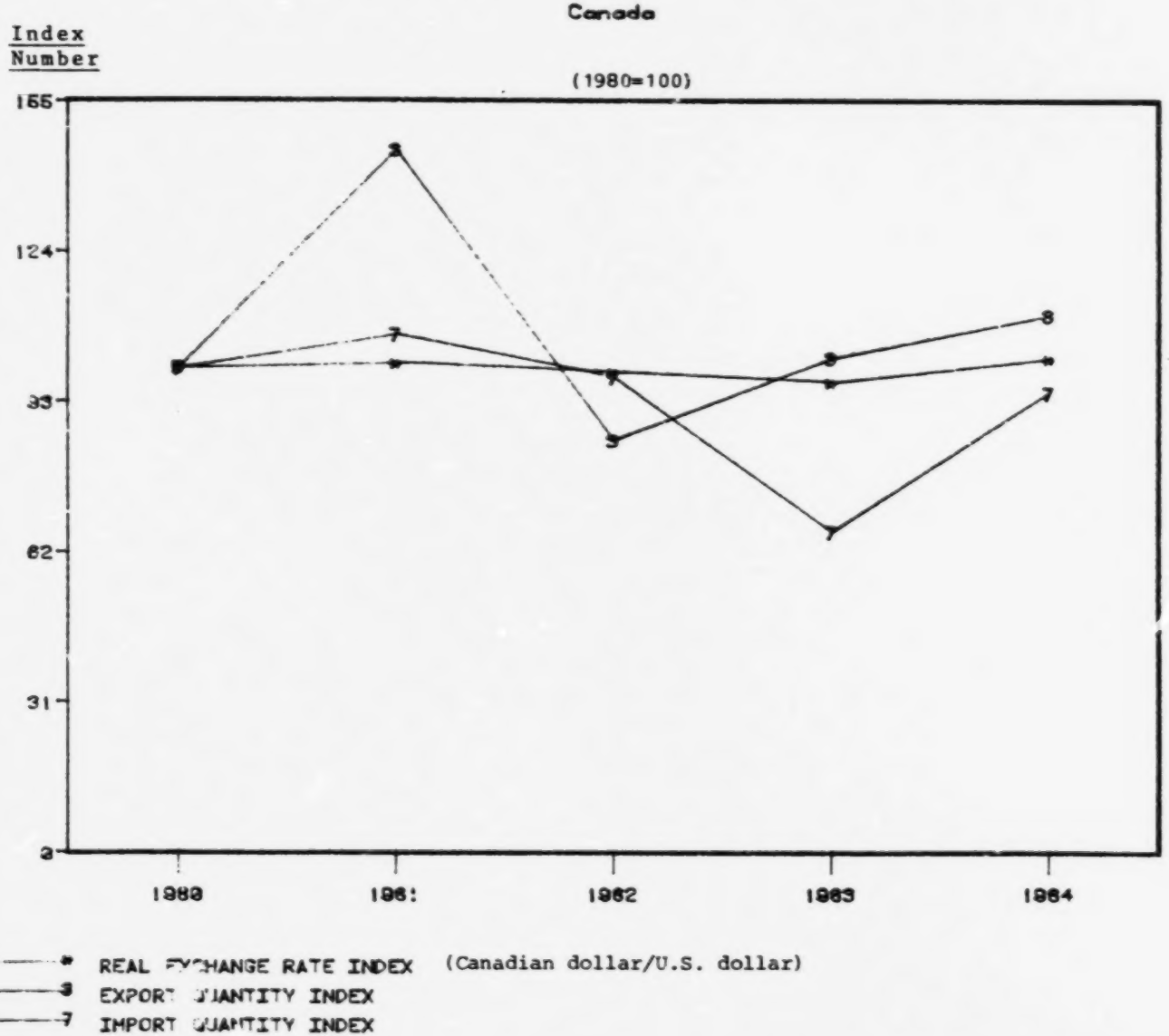
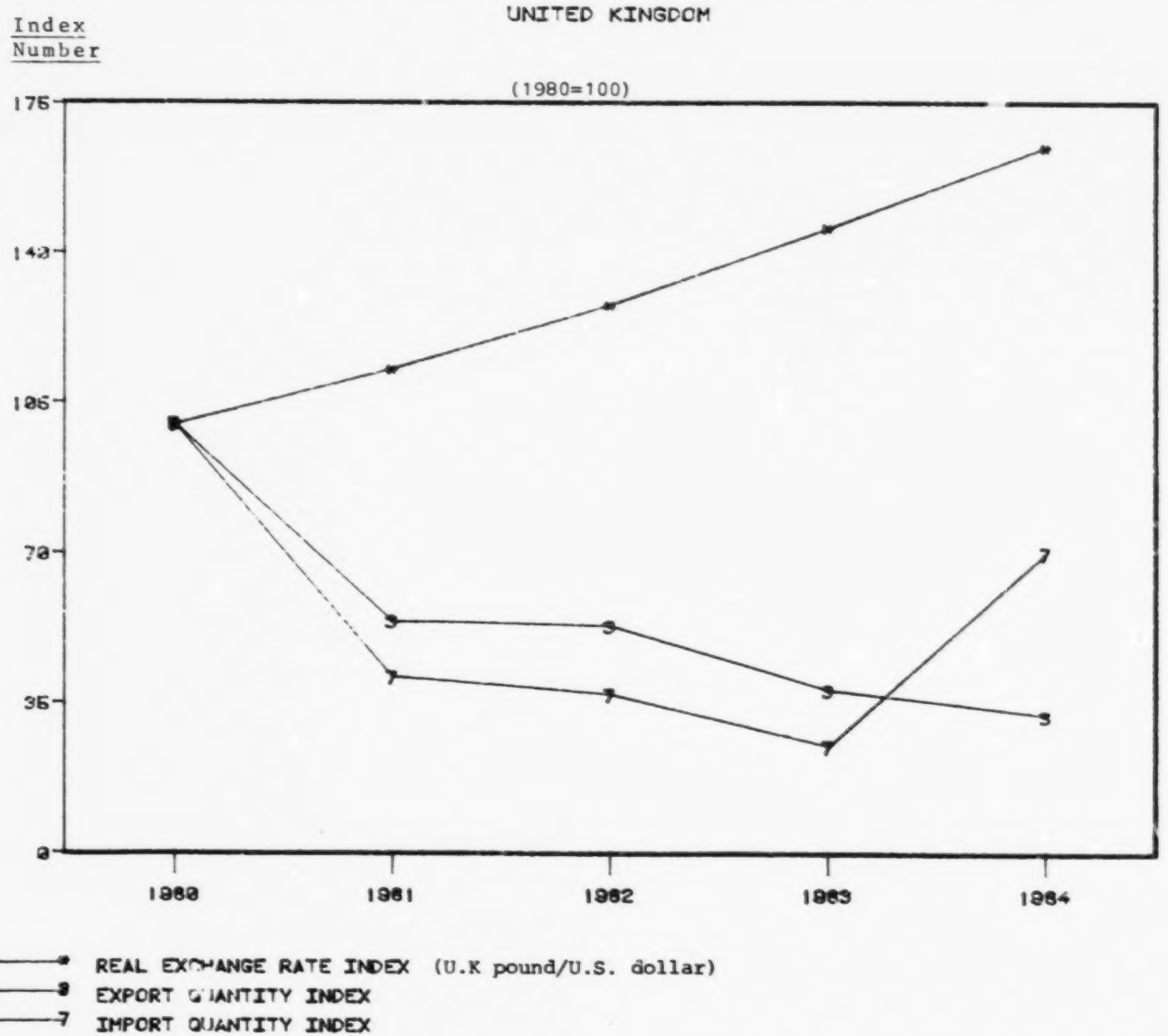
Figure 7.--Trends in U.S. exports and imports of ball and roller bearings compared with the real exchange relationships between the Canadian and U.S. dollars, 1980-84.



Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 8.--Trends in the U.S. exports and imports of ball and roller bearings compared with the real exchange relationships between the U.S. dollar and the British pound, 1980-84.



Source: Compiled from official statistics of the U.S. Department of Commerce.

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Manufacturing technology in the bearing industry is constantly changing. Use of CAD and CAM is beginning to play an important role in the competitiveness of bearing companies. Bearing manufacturers that use CAD/CAM techniques in manufacturing operations are in a better competitive position as a result of faster delivery and more precisely manufactured bearings.

Most major world manufacturers have invested heavily in R&D resulting in both new product and manufacturing technology. For example, since a key factor in bearing production is cleanliness, several firms are restructuring their plants to provide manufacturing facilities that are free of dirt. 1/ Tooling is also considered a key element in the production of "quality" bearings. Robots are being introduced in several plants to increase productivity in the manufacture of bearings. 2/ NTN, a major foreign producer of bearings, designs its own machinery to produce higher quality bearings. 3/ Company officials of NTN Bearing Corp. of America believe that by designing their own machinery for bearing production, they can control bearing quality more effectively.

A few bearing firms, both in the United States and abroad, also produce their own steel. These companies have an extra technological advantage because their steel is made specifically for bearing production and meets the most rigorous specifications for purity, fatigue strength, machinability, suitability for heat treatment, and many other special properties. 4/

The product technology of bearing producers is very competitive. Certain countries have an advantage in different types of bearing technology because they have concentrated on the development of these products. For example, U.S. firms, especially the Timken Co., are the leading producers of tapered roller bearings, closely followed by Japanese producers, particularly NTN. Swiss firms, especially RMB, are known for precision bearings used in aircraft, military equipment, and other specialized products.

According to respondents to the Commission's questionnaire, 26 producers out of 29 responding have improved quality of their bearings in response to increased competition in the U.S. market from foreign-made ball and roller bearings, components, and parts. Only 9 out of the 29 respondents shifted to more advanced types of bearings.

Much technology is transferred by joint ventures. Several major bearing producers have formed joint ventures, mostly with Japanese companies, to exchange technology and to "remain" in the competitive market. 5/ For example, a small French company, Societe' de Mechanique Magnetique (S2M), has developed a bearing- the magnetic bearing- that can be used at very high speeds with no vibration. These bearings are extremely expensive, and have limited current commercial applications. Early in 1984, S2M formed a joint venture with Seiko Instruments & Electronics, Ltd. (Japan) and the Inland Motor Specialty Products Division of Kollmorgen Corp. (United States). S2M

1/ American Machinist, July 1984, p. 102.
2/ Staff interviews with industry officials.
3/ Ibid.
4/ Ibid.
5/ Ibid.

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hopes the magnetic bearings will be used in every industry to replace oil-lubricated bearings in some types of machinery. 1/

As imports of commodity-type bearings increase, U.S. producers have put more emphasis on the production of specialty bearings used in the defense, aerospace, automotive, and computer industries. The United States is considered a leader in the production of "high tech" specialty bearings that require special designs, tooling and manufacturing techniques as well as quality raw materials, and testing equipment. 2/ Presently, the United States bearing industry is considered the leader for high-technology bearing products, but the foreign manufacturers are closing the gap. 3/

Raw and semiprocessed materials and labor

Bearing steel (wire, wire rod, tube, and bar) is the major material in the production of ball and roller bearings. Other products associated with bearing production are grinding oils and lubricants. 4/ Critical factors in steel purchasing decisions for bearing producers are quality and price. Steel costs represent approximately 40 percent of the costs of production. 5/ Semiprocessed materials are important to the manufacture of bearings because the performance and quality of a bearing depends on the quality of material from which the bearing is manufactured. 6/

The high cost of steel has become a major concern for the U.S. bearing industry. 7/ The Japanese and European producers benefit from lower steel prices. 8/ According to industry sources, the majority of U.S. bearing manufacturers buy foreign steel because the quality grade needed for bearings is not readily available from the U.S. steel industry at prices as low as imported steel. 9/ The majority of all bearing steel is imported from Japan, Sweden, the United Kingdom, West Germany, and France. The lowest priced steel was West German steel, which in 1985 averaged 17 percent less than U.S. steel; Japanese, French, British, and Swedish steel prices in 1985 were on the average 14 percent lower than U.S. prices. 10/ There are a few U.S. bearing manufacturers with their own steel production capacity; however, these manufacturers of bearing-grade steel primarily use such steel for their own bearing production. The Timken Co. recently completed construction of a new

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1/ Business Week, Sept. 3, 1984, p. 90.

2/ Statement on behalf of the Anti-Friction Bearing Manufacturers Association, Sept. 26, 1985, p. 4.

3/ Brief submitted by the Economic Consulting Service Inc., September 1985, p. 29.

4/ Statement on behalf of the Anti-Friction Bearing Manufacturers Association, Sept. 26, 1985, p. 10.

5/ Staff interviews with industry officials.

6/ Official Transcript, Oct. 3, 1985, p. 62.

7/ A discussion of the impact on the U.S. ball and roller bearing industry of the effects of the voluntary restraint arrangements on imported steel, including both the availability and costs of imported raw materials, can be found in USITC Publication 1788 released December 1985, The Effects of Restraining U.S. Steel Imports on the Exports of Selected Steel-Consuming Industries.

8/ Obtained from data submitted in response to questionnaires of the U.S. International Trade Commission.

9/ Hearing transcript, Oct. 3, 1985, pp. 181-183.

10/ Staff interviews with industry officials.

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steel mill located in Canton, OH, with a capital investment of approximately $500 million. 1/ This new steel mill was built in part to add to the competitiveness of the Timken Co. in the bearing market as well as to provide a better quality product and to reduce the cost of production. 2/ Timken disagrees with most other major U.S. bearing manufacturers surveyed by the Commission on the availability of bearing quality steel in the United States. Timken representatives have no doubt that bearing quality steel (52100 wire, rod, and tubing) is available from U.S. steel producers and has been for some time. 3/ The Timken Co. further states that U.S. bearing producers have been purchasing bearing-quality steel overseas because of very low foreign prices, and because U.S. steel producers have not received enough orders for bearing-quality steel to justify production. 4/

Respondents to the Commission's questionnaire reported alloy steel as the largest expense for bearing manufacturers; such producers spent $437 million in 1980 and $437 million in 1984 for this steel (table 37). Respondents also reported that imports represented 45 percent of these costs in 1984 compared with 41 percent in 1980. Producers were estimated to have spent $104 million in 1980 and $90 million in 1984 on carbon steel mill shapes and forms. During 1980-84, the cost of stainless steel mill shapes and forms varied from a low of $6.6 million in 1983 to a high of $8.8 million in 1981 (table 37). 5/

No specific data on labor costs are available for the bearing industry in the major competitive countries. However, industry sources indicate that labor rates in Japan, West Germany, and other Western European countries are about two or three times greater than the minimum wage in the United States. Countries exporting bearing products at very low values, pay lower wages than the United States, sometimes far below the legal minimum wage in the United States; therefore, companies with production facilities in less industrialized nations benefit from lower labor rates. 6/

Quality and performance features

The U.S. bearing industry is capable of manufacturing almost any type of ball or roller bearing, as are major foreign competitors. According to data obtained from interviews with bearing producers and purchasers, U.S.-produced bearings are comparable in quality with those produced in the most advanced foreign manufacturing facilities.

On the basis of data received from respondents of the Commission's questionnaire, nine U.S. companies report that service is better for Japanese-produced ball bearings as well as availability of parts, reliability of supplier, service, availability of product on short notice, technical features and performance characteristics, and engineering and design assistance. U.S. ball bearing producers compared with Japanese bearing producers provide better warranties, product quality, durability, and reliability. Attributes of U.S.-produced roller bearings rank higher than for Japanese produced bearings in all categories, except in availability of parts, supplier reliability, and

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1/ Hearing transcript, Oct. 3, 1985, p. 63.
2/ Op. cit.
3/ Timken Co. post hearing submission, Oct. 17, 1985, p. 57.
4/ Ibid., p. 58.
5/ Information submitted by U.S. producers in response to questions about cost of materials.
6/ Hearing Transcript, Oct. 3, 1985, p. 192.

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Table 37.--Ball and roller bearings, components, and parts: Cost of materials for specified products, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Item	1980	1981	1982	1983	1984	January-June--	
						1984	1985
Delivered costs of:							
Materials, parts containers and supplies, total	879,674	957,346	676,544	676,868	891,496	456,951	419,421
Carbon steel mill shapes and forms, except casting	104,484	109,930	73,198	70,646	89,741	46,047	50,387
Percentage of cost represented by imports--percent	52	54	27	30	37	38	31
Alloy/steel mill shapes and forms, except casting	437,188	476,983	300,753	324,847	436,544	223,254	175,945
Percentage of cost represented by imports--percent	41	41	42	41	45	44	46
Stainless steel mill shapes and forms, except casting	7,984	8,785	6,726	6,645	8,420	4,303	4,474
Percentage of cost represented by imports--percent	29	30	31	45	29	29	25
Ball bearings, components, and parts	128,762	128,804	102,576	102,540	131,384	67,576	66,366
Percentage of cost represented by imports--percent	51	57	58	52	36	34	41
Roller bearings components, and parts	91,053	95,913	75,927	61,330	89,198	43,309	51,803
Percentage of cost represented by imports percent	48	62	64	48	49	49	47

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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service. Attributes of U.S. ball and roller bearings also rank higher than or equal to German bearings.

Recently, there has been an increase in ball and roller bearing imports from Eastern bloc countries, especially Romania. U.S. industry representatives indicate that these bearings are poor in quality, have a shorter life span rate as well as poor engineering and design assistance. 1/ Overall, the U.S. bearing industry is known for the quality bearings they produce. 2/

Marketing

Marketing practices vary considerably among the various segments of this industry. Typically, the major sales targets of U.S. producers and importers are original-equipment manufacturers and distributors. Import competition occurred initially in the high-volume OEM market, but now it is increasing somewhat in the distributor/aftermarket channel.

Respondents to the Commission's producer questionnaire reported sales, by type of product and channel of distribution, for 1980 and 1984. U.S. producers' domestic shipments of U.S.-produced bearings and parts, in total, showed little variation, by type of channel of distribution, in the 2 years. In 1980, OEM's accounted for 67 percent of total sales in terms of value, compared with 29 percent for distributors, and 4 percent to other outlets such as local, State, and Federal Governments. By 1984, the only change was a slight increase in sales to OEM's (68 percent), compared with 28 percent for distributors. Distribution by U.S. producers of U.S.-produced bearings and parts, by type, appears in table 38.

The OEM's share of total U.S. producers' sales of imported bearings and parts, in total, accounted for 65 percent (by value) in 1980, declining to 62 percent in 1984. The distributors' share of such sales rose from 30 percent to 34 percent in 1984 compared with that in 1980. U.S. producers sold a somewhat higher share of their imported bearings and parts to distributors than their U.S.-produced products, and this practice increased in 1984 compared with the practice in 1980. Distribution by U.S. producers of imported bearings and parts, by type, appears in table 39.

For sales to OEM customers, many U.S. bearing producers employ sales forces consisting of graduate engineers; this practice represents a significant education and training expense that is frequently not borne by foreign suppliers. Bearing suppliers in the U.S. market often will organize into specialized sales departments such as automotive, industrial, and railroad. Although companies that specialize in one market, or only a few markets, have the advantage of acquired expertise, including engineering and service capabilities, companies that offer a broad range of products provide the customer with the convenience of placing one order. In addition, those bearing companies that have a full product line may sell to only one

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1/ Industry interviews.

2/ Statement on behalf of the Anti-Friction Bearing Manufacturers Association, Sept. 26, 1985, p. 4.

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Table 38.--Ball and roller bearings and parts: Percentage distribution of U.S. producers' domestic shipments of U.S.-produced bearings, by major types and market channels, 1980 and 1984

(In percent)

Item and marketing channel	1980	1984
Ball bearings, complete:		
OEM	64	66
Distributor	30	27
Other	6	7
Total	100	100
Cups for tapered roller bearings:		
OEM	82	75
Distributor	17	24
Other	1	1
Total	100	100
Cone and roller assemblies for tapered roller bearings:		
OEM	80	75
Distributor	19	24
Other	1	1
Total	100	100
Other roller bearings:		
Cylindrical:		
OEM	68	67
Distributor	29	28
Other	3	5
Total	100	100
Spherical:		
OEM	68	67
Distributor	29	28
Other	3	5
Total	100	100
Needle:		
OEM	79	84
Distributor	20	15
Other	1	1
Total	100	100
Other roller bearings:		
OEM	98	94
Distributor	2	3
Other	0	3
Total	100	100
Mounted ball bearings, except plain:		
OEM	24	24
Distributor	54	58
Other	22	18
Total	100	100

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Table 38.--Ball and roller bearings and parts: Percentage distribution of U.S. producers' domestic shipments of U.S.-produced bearings, by major types and market channels, 1980 and 1984--Continued

(In percent)

Item and marketing channel	1980	1984
Mounted roller bearings, except plain:		
OEM	25	20
Distributor	73	77
Other	2	3
Total	100	100
Other components and parts of ball and roller bearings:		
OEM	85	92
Distributor	12	7
Other	3	1
Total	100	100

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

purchasing agent. One large U.S. bearing producer that also imports indicated that it once sold to only large-volume markets by means of extensive advertising. Currently, however, this company specifically targets market segments--an approach it claims is unique among large bearing companies but not to small bearing companies (or to many companies outside this industry). 1/

Ball and roller bearing distributors may be classified into three groups, based on size; size, in turn is a function of the number of locations. According to industry sources, there are three U.S. distributors with annual sales of $200 million to $500 million, and another distributor with sales of $80 million to $199 million; the majority of remaining firms consist of 1 or 2 outlets with sales of several million dollars each. Distributors tend to serve a wide range of markets but often will specialize in serving certain industries because of the types of customers in their geographic area.

Distributors responding to the Commission's questionnaire served a variety of markets, but some concentration occurred in the following industries: agriculture and farm equipment, food processing and packing, mining, forest products, steel, motor vehicles, and machine tools. Such distributors handled a number of other products such as power transmission products, material handling equipment, rubber products, plain bearings, gear reducers, and variable speed motor controllers. These distributors indicated that bearings and parts accounted for 30 to 55 percent of their total sales revenue. Distributors buy replacement bearings that keep machinery operating. Such bearings are similar to those bearings sold to OEM's, but

1/ Staff interviews with officials of U.S. producers and importers.

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Table 39.--Ball and roller bearings and parts: Percentage distribution of U.S. producers' domestic shipments of imported bearings, by major types and market channels, 1980 and 1984

(In percent)

Item and marketing channel	1980	1984
Ball bearings, complete:		
OEM	61	61
Distributor	33	34
Other	6	5
Total	100	100
Cups and cone assemblies for tapered roller bearings shipped as a set:		
OEM	89	81
Distributor	10	19
Other	1	0
Total	100	100
Cone and roller assemblies for tapered roller bearings:		
OEM	81	74
Distributor	18	26
Other	1	0
Total	100	100
Other roller bearings:		
Cylindrical:		
OEM	57	58
Distributor	39	42
Other	4	0
Total	100	100
Spherical:		
OEM	52	49
Distributor	44	49
Other	4	2
Total	100	100
Needle:		
OEM	85	74
Distributor	11	25
Other	4	1
Total	100	100
Other roller bearings:		
OEM	97	95
Distributor	3	5
Other	0	0
Total	100	100
Mounted ball bearings, except plain:		
OEM	59	54
Distributor	36	41
Other	5	5
Total	100	100

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Table 39.--Ball and roller bearings and parts: Percentage distribution of U.S. producers' domestic shipments of imported bearings, by major types and market channels, 1980 and 1984--Continued

(In percent)

Item and marketing channel	1980	1984
Mounted roller bearings, except plain:		
OEM	70	40
Distributor	30	60
Other	0	0
Total	100	100
Other components and parts of ball and roller bearings:		
OEM	35	71
Distributor	18	29
Other	47	0
Total	100	100

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

purchases are made on a "buy" basis rather than on a "bid and buy" basis common with sales to OEM's. Distributors selling to an automobile company may have 1,200 to 1,500 bearings of different sizes available, whereas, a bearing manufacturer might sell only 7 or 8 different-sized bearings to that same automobile company. One distributor with annual sales of over $100 million reported to the Commission staff that it does not handle Japanese-produced bearings because of consumer resistance, loyalty to old suppliers, and because many Japanese suppliers do not offer complete lines.

Government intervention

A section of the producers' questionnaire requested that firms identify countries with practices that could act as trade barriers. The questionnaire listed five main categories of potential trade barriers: (1) quantitative restrictions and similar specific limitations; (2) nontariff charges on imports; (3) Government participation in trade; (4) standards (such as health and safety); and (5) customs procedures and administrative practices. Subcategories were listed under each main category. For example, quotas, local content, mixing requirements, and discriminatory bilateral agreements as well as many other potential obstacles to free trade and investment were listed under main category one. Border taxes and stamp taxes, among other barriers, were listed under main category two. Subsidies and "laws and practices discouraging imports" were listed under main category three, while labeling, packaging, and product content requirements were among the subcategories listed under main category four. Merchandise classification requirements and documentation requirements were among the subcategories of main category five. Firms were also asked to point out countries applying

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discriminatory ocean freight rates and to list any countries practicing trade barriers not covered by the questionnaire.

Table 40 presents the raw data, aggregated by main category collected in the questionnaires. Statistics refer to the number of times a given country was mentioned as a practitioner of a particular form of trade barrier.

However, the raw data presented in table 39 presents only a limited picture of trade barriers in particular countries. Many more U.S. firms export to Mexico and Canada than to Israel or Italy. The high number of citations recorded for Mexico and Canada, and the relatively low number recorded for Israel and Italy, may be a function of the degree to which U.S. exporters are familiar with these countries, rather than the degree to which these countries practice potentially objectionable policies. A methodology was devised to eliminate this potentially distorting effect. 1/

Although Mexico was cited most frequently in the questionnaire data, its share of total citations was somewhat less than its share of the U.S. export market. The higher the figure in column five, the greater the extent to which U.S. producers' questionnaire responses indicate that a country practices international trade barriers in regard to U.S. exports of ball and roller bearings (table 41).

Future Trends in the Industry

Markets

The increased proportion of front-wheel-drive automobiles being produced has greatly reduced the demand for some types of ball and taper roller bearings, (such as those used in an automobile's differential). Overall, however, front-wheel-drive cars use more bearings, particularly of the needle roller type. Many of the new bearings required in these down-sized

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1/ The Commission staff compared countries' share of total U.S. exports of ball and roller bearings and parts with their share total of citations for trade barriers in the questionnaire data. For example, U.S. firms cited Mexico 37 times for trade barriers. Citations of Mexico accounted for 37/303 or 12.2 percent of total citations. Mexico accounts for 13.1 percent of U.S. exports however; so, the ratio for Mexico presented in table 41 is calculated as follows:

$$\frac{12.2}{13.1} = 0.93$$

The share of U.S. exports in 1984 is used in this case as an approximation of U.S. exporters' familiarity with a country's trade practices. The resulting ratio, presented in column four, is a better measure of the extent to which a given country practices international trade barriers in regard to U.S. exports of ball and roller bearings.

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Table 40.--International trade barriers to U.S. exports of ball and roller bearings: Citations of barriers, by countries and types of barriers, as reported in responses to the Commission's questionnaires

Country	Total	Quantitative restrictions and similar specific limitations	Nontariff charges on imports	Government participation in trade	Standards (i.e., health, packaging, and labeling)	Customs procedures and administrative practices
Mexico	37	14	2	8	5	8
Brazil	28	13	4	0	3	8
Japan	29	8	1	14	3	1
India	22	7	2	5	7	1
France	18	2	2	7	2	5
Latin America 1/	17	8	3	1	0	5
Colombia	17	5	2	2	3	5
South Africa	14	4	1	1	2	5
Canada	14	3	1	4	3	3
West Germany	12	2	2	5	2	1
United Kingdom	11	1	0	5	3	2
Australia	10	3	1	3	2	1
Cameroon 1/	9	2	0	5	0	2
Venezuela	9	2	1	2	2	2
EC West Europe 1/	7	2	2	0	0	3
Italy	7	2	1	1	2	1
Israel	7	0	0	3	3	1
Republic of Korea	5	1	0	1	2	1
Chile	4	1	1	0	0	1
Argentina	3	1	0	0	1	1
Switzerland	3	0	0	0	2	1
Sweden	3	0	3	0	0	0
Central America	3	2	0	0	0	1
Philippines	2	2	0	0	0	0
Arab countries	2	2	0	0	0	0
Thailand	2	0	0	1	1	0
Africa	1	1	0	0	0	0
Egypt	1	1	0	0	0	0
Spain	1	1	0	0	0	0
Taiwan	1	0	0	0	1	0
Southeast Asia	0	0	0	0	0	1
Panama	1	0	0	0	0	1
Singapore	1	0	1	0	0	0
New Zealand	1	0	1	0	0	0

1/ In response to the questionnaires, some firms chose to list by continent or geographical area. Such categories do not include individual citations of particular countries within a category, but only direct citations of the category itself.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table 41.--International trade barriers to U.S. exports of ball and roller bearings: Citations of barriers from Commission's questionnaires, adjusted for percent of U.S. exports in 1984

Country	Actual number of citations	Share of U.S. exports in 1984	Share of citations	Trade citations/exports
Mexico	37	13.1	12.21	0.93
Japan	29	2.2	9.57	4.35
Brazil	28	3.7	9.24	2.50
India	22	1.5	7.26	4.84
France	18	2.5	5.90	2.36
Latin America	17	-	5.61	-
Colombia	17	2.0	5.61	-
South Africa	14	3.0	4.62	1.54
Canada	14	31.9	4.62	.14
West Germany	12	5.7	3.96	.69
United Kingdom	11	5.2	3.63	.70
Australia	10	4.5	3.30	.73
Comecon	9	-	2.97	-
Venezuela	9	4.1	2.97	.72
EC	7	-	2.31	-
Italy	7	1.5	2.31	1.54
Israel	7	.3	2.31	7.70
Republic of Korea	5	1.4	1.65	1.18
Chile	4	.3	1.32	4.40
Argentina	3	1.5	.99	.66
Switzerland	3	.4	.99	2.48
Sweden	3	.4	.99	2.48
Central America	3	-	.99	-
Philippines	2	.2	.66	3.30
Arab countries	2	-	.66	-
Thailand	2	.2	.66	3.30
Africa	1	-	.33	-
Egypt	1	.1	.33	6.60
Spain	1	.6	.33	.55
Taiwan	1	.9	.33	.37
South East Asia	1	-	.33	-
Panama	1	-	.33	-
Singapore	1	2.2	.33	.15
New Zealand	1	.1	.33	3.30
Total	303	-	1/ 100.00	-

1/ Total does not add to 100 percent due to rounding.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission and export data from the U.S. Department of Commerce.

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front-wheel-drive cars have considerably higher prices than the bearings they replace. Another example of changing demand in the bearing industry concerns the movement toward larger railroad boxcars, just one of the factors lessening the demand by railways for large roller bearings.

An example of a geographical change in the bearing markets is the relocation of the bearing-intensive-shipbuilding industry, which is now concentrated in East Asia rather than in the United States. Likewise, the location of consumer product production has shifted toward the Far East. Consequently, as products using bearings are increasingly being manufactured in East Asia, it may be expected that more bearing production will also soon be shifted there.

Technological change is beginning to bring about a trend toward highly specialized precision bearings. For instance, the development of ceramic bearings is being promoted with the expectation for application in the aerospace industry, where ceramic bearings' lightweight and freedom from the need for lubrication are especially important. Currently, however, production costs for ceramic bearings have not fallen sufficiently to allow a market to develop. In addition, a French company has developed a magnetic bearing that can be used at very high speeds with no vibration. The extent to which these and other new products replace bearings currently in use, remains to be seen.

Shifts in production of bearing consuming products among countries in recent years has affected the sourcing of bearings. The most significant change has been the shift in automobile production from the United States to Japan. As indicated in table 31, during 1973-82, the annual growth rate for transportation equipment in Japan rose 25 percent, compared with a decline of 1.3 percent in the United States. In addition to changes such as this among traditional producers, the largest growth rates of major bearing consuming industries during 1973-82 occurred in developing markets such as Mexico, Venezuela, Korea, and Singapore.

Product developments

Bearing manufacturers rely heavily on product development to keep pace with new technology in major consuming industries. The trends in these industries, especially machine tool, automotive, construction, and metalworking, are toward smaller, more efficient bearings.

Bearings made from new materials offer present and future promise. Demand for ceramic bearings is increasing as customers require more wear-resistant, high-temperature bearings. However, despite growing demand, high manufacturing costs will limit ceramic bearings to very selective market applications. Typical applications are in precision grinding spindles and abrasive fluid pumping systems. Once competitively priced, fine ceramic bearings are expected to find usage in aircraft and space vehicles that require lightweight components; in jet engines and rotating parts of furnaces and high-temperature airblast devices that require thermal resistance; and as bearings for machinery using no lubrication such as vacuum pumps.

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Carbon graphite is another material being developed for bearings. Carbon-graphite bearings are used in high-temperature machinery, requiring prolonged use. However, these bearings are brittle and impact sensitive, qualities which limit their applications.

Packaged bearings have become increasingly popular in the automotive industry in an attempt to reduce assembly time and inventory. These packages are delivered to the customer presealed and prelubricated in ready-to-install structures. Miniature precision and instrument bearings are important to the defense industry as well as to the expanding business machine industry. Miniature bearings are expected to grow in demand as both these industries require smaller more precision bearings.

Thin section bearings were developed for use where design space and weight must be conserved. These bearings also reduce the number of components in a design. Typical applications include CAT scanners, office copiers, and indexing devices. 1/ A recent development, as mentioned in the technology section, is the active magnetic bearing (AMB). AMB's are under research in Western Europe, the United States, and Japan; such bearings are most commonly used in metal-cutting and grinding machine tools, shipboard rotating equipment, and turbines. AMB's operate by suspending a ferrous rotating element within a circularly oriented magnetic field, maintaining circularity by adjusting the field in response to feedback provided by an electronic circuit in the controller. This type of bearing gives greater speed and accuracy to machine components. 2/

The machine tool industry with its faster, more precise machinery is responsible for many new developments of longer lasting, faster bearings. An example of such a bearing is the speed spindle bearing that improves accuracy as well as longevity in machinery.

1/ Joe Gebhardt, "Bearings-The Friction Fighters," Power Transmission Design, July 1985, p. B13.

2/ Power Transmission Design 1985 Handbook, p. A/157.

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APPENDIX A

LETTER OF REQUEST FROM CHAIRMAN, SUBCOMMITTEE ON TRADE, COMMITTEE ON WAYS AND MEANS, U.S. HOUSE OF REPRESENTATIVES

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SAM M. GIBBONS, FLORIDA, CHAIRMAN
SUBCOMMITTEE ON TRADE

DAN ROSTENKOWSKI, ILLINOIS
ED JENKINS, GEORGIA
THOMAS J. DOWNEY, NEW YORK
DON J. PEASE, OHIO
CECIL (CEC) HEFTEL, HAWAII
MARTY RUSSO, ILLINOIS
RICHARD A. GEPHARDT, MISSOURI
FRANK J. GUARINI, NEW JERSEY

PHILIP M. CRANE, ILLINOIS
BILL ARCHER, TEXAS
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BILL FRENZEL, MINNESOTA
RICHARD T. SCHULZE, PENNSYLVANIA

EX OFFICIO:
JOHN J. DUNCAN, TENNESSEE

DAN ROSTENKOWSKI, ILLINOIS, CHAIRMAN
COMMITTEE ON WAYS AND MEANS

JOSEPH K. DOWLEY, CHIEF COUNSEL
A.L. SINGLETON, MINORITY CHIEF OF STAFF

RUFUS YERXA, SUBCOMMITTEE STAFF DIRECTOR

COMMITTEE ON WAYS AND MEANS

U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

SUBCOMMITTEE ON TRADE

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OFFICE OF THE CHAIRWOMAN
USITC

March 29, 1985

The Honorable Paula Stern
Chairwoman
United States International Trade Commission
701 E Street, N.W.
Washington, D.C. 20436

Dear Madam Chairwoman:

On behalf of the Subcommittee on Trade, I would like to request the U.S. International Trade Commission to conduct an investigation pursuant to section 332 of the Tariff Act of 1930, as amended, on the competitive position in domestic and world markets of the U.S. industry producing antifriction balls and rollers and ball and roller bearings.

The domestic industry consists of approximately 150 esablishments, employs about 45,000 persons, and performs a vital function in the U.S. economy by providing essential components to many other industries, some of which fill important defense requirements. In consideration of the increasing share of imports to total apparent U.S. consumption of these products in recent years, this Subcommittee is interested in obtaining an independent assessment of the current competitive position and future direction of the U.S. ball and roller bearing industry vis-a-vis that of the foreign industry.

The study should deal principally with the major products produced by this industry, particularly those that are experiencing increased U.S. import competition. The analyses should cover the following points, as fully as available data permit: (1) current profile of the U.S. and major foreign ball and roller bearing industries; (2) a profile and current status of the U.S. and major foreign markets; (3) conditions of competition between the U.S. and foreign industries; and (4) future trends and markets for these products.

In light of the considerable interest that has been expressed concerning this U.S. industry, it is recommended that the Commission hold a public hearing to afford interested parties the opportunity

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to provide useful comments. In addition, I have asked the U.S. Department of Defense, the Federal Trade Commission, and the U.S. Department of Commerce to cooperate with the Commission in the conduct of this study. The investigation should begin as soon as possible, with the final report to be submitted to the Subcommittee within nine months of the receipt of this request.

Sincerely,

Sam M. Gibbons
Chairman

SMG/JANm

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APPENDIX B

NOTICE OF INSTITUTION OF INVESTIGATION NO. 332-211

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[332-211]

Competitive Assessment of the U.S. Ball and Roller Bearing Industry

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of public hearing.

SUMMARY: Following receipt of a request from the Subcommittee on Trade of the House Committee on Ways and Means, the Commission has instituted on its own motion investigation No. 332-211 under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)), for the purpose of gathering and presenting information on the competitive position in domestic and world markets of the U.S. industry producing antifriction balls and rollers and ball and roller bearings.

EFFECTIVE DATE: April 17, 1985.

FOR FURTHER INFORMATION CONTACT: Mr. David Slingerland (telephone 202-523-0263) or Ms. Carla Springer (telephone 202-523-0108), Machinery and Equipment Division, U.S. International Trade Commission, Washington, D.C. 20436.

SUPPLEMENTARY INFORMATION: In its study the Commission has been requested to deal principally with the major products produced by the industry, particularly those that are experiencing increased U.S. import competition. In addition, it was requested that the Commission's analyses cover, as fully as available data permit, the following points:

1. Current profile of the U.S. and major foreign ball and roller bearing industries;
2. A profile and current status of the U.S. and major foreign markets;
3. Conditions of competition between the U.S. and foreign industries; and
4. Future trends and markets for these products.

The Subcommittee recommended that the Commission hold a public hearing and has asked the U.S. Departments of Defense and Commerce and the Federal Trade Commission to cooperate with the Commission in the conduct of the study.

Public Hearing

A public hearing in connection with the investigation will be held at the U.S. International Trade Commission Building, 701 E Street NW., Washington, D.C., beginning at 10:00 a.m., on October 3, 1985, to be continued on October 4, 1985, if required. All persons shall have the right to appear, by counsel or in person, to present information and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 701 E Street, NW., Washington, D.C. 20436, not later than noon, September 26, 1985.

Written Submissions

In lieu of or in addition to appearances at the public hearing, interested persons are invited to submit investigation. Written statements should be received by the close of business on September 26, 1985. Commercial or financial information which a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of § 201.6 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.6). All written submissions, except for confidential business information, will be made available for inspection by interested persons. All submissions should be addressed to the Secretary, United States International Trade Commission, 701 E Street NW Washington, D.C. 20436.

Issued: April 19, 1985.

By order of the Commission.

Kenneth R. Mason,

Secretary.

[FR Doc. 85-0944 Filed 4-23-85; 8:45 am]

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APPENDIX C

CALENDAR OF PUBLIC HEARING

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CALENDAR OF PUBLIC HEARING

Those listed below appeared as witnesses at the United States International Trade Commission's hearing on:

Subject : Competitive Assessment of the U.S. Ball and Roller Bearing Industry

Inv. No. : 332-211

Date and time: October 3, 1985 - 10:00 a.m.

Sessions were held in the Hearing Room of the United States International Trade Commission, 701 E Street, N.W., in Washington.

Congressional appearances:

Honorable Barbara B. Kennelly, United States Representative, State of Connecticut

Honorable Nancy L. Johnson, United States Representative, State of Connecticut

DOMESTIC:

PANEL 1

OVERALL POLICY STATEMENT

Anthony Gerace, Assistant Director, Region No.-9A, United Automobile Aerospace and Agricultural Implement Workers of America

Steven Beckman, Governmental Affairs Department, United Automobile Aerospace and Agricultural Implement Workers of America

- more -

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PANEL 2

IMPACT ON LOCAL LEVEL

Angelo Franculli, Torrington Company - United Automobile Aerospace and Agricultural Implement Workers of America-UAW Local 1645

Jack Cassidy, TRW Bearing Company, UAW Local 197, United Automobile, Aerospace and Agricultural Implement Workers of America

Josephine Yanchek, Fafnir Bearing Company - United Automobile, Aerospace and Agricultural Implement Workers of America - President, Local 133

George Vazzina, Fafnir Bearing Company - United Automobile, Aerospace and Agricultural Implement Workers of America, Local 133

Stewart and Stewart--Counsel
Washington, D.C.
on behalf of

Timken Company

Joseph F. Toot, Jr., President, The Timken Company

J. Kevin Ramsey, Secretary

Richard M. Chapis, Corporate Counsel

Eugene L. Stewart--OF COUNSEL

- more -

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Covington & Burling--Counsel
Washington, D.C.
on behalf of

Anti-Friction Bearing Manufacturers Association

Thomas M. Barrett, Chairman of the Anti-Friction Bearing Manufacturers Association; General Manager of the Ball and Roller Group, Hoover Universal Inc.

James J. Whitsett, President of the Anti-Friction Bearing Manufacturers Association

Economic Consulting Services, Inc.

Bruce P. Malashevich, Vice President

Harvey M. Applebaum)
Dana T. Ackerly)--OF COUNSEL

Harold M. Brodsky, President of the Fafnir Bearing Division of Textron, Inc.

Thomas E. Bennett, President of The Torrington Company, Torrington, Connecticut

and

Thomas Monios, Vice President and General Manager, TRW Bearing Div.

Donohue and Donohue--Counsel
New York, N.Y.
Coudert Brothers--Counsel
Washington, D.C.
on behalf of

NSK Corporation, Ann Arbor, Michigan

Bruce Paxton, President

Donohue and Donohue

Joseph F. Donohue--OF COUNSEL

Coudert Brothers

Milo Coerper--OF COUNSEL

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IMPORTERS:

Tanaka, Walders & Ritger--Counsel
Washington, D.C.
on behalf of

The Japan Bearing Industrial Association (JBIA)

James C. Davenport, Economist

H. William Tanaka--OF COUNSEL

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APPENDIX D

STEPS IN THE MANUFACTURE OF A BALL BEARING

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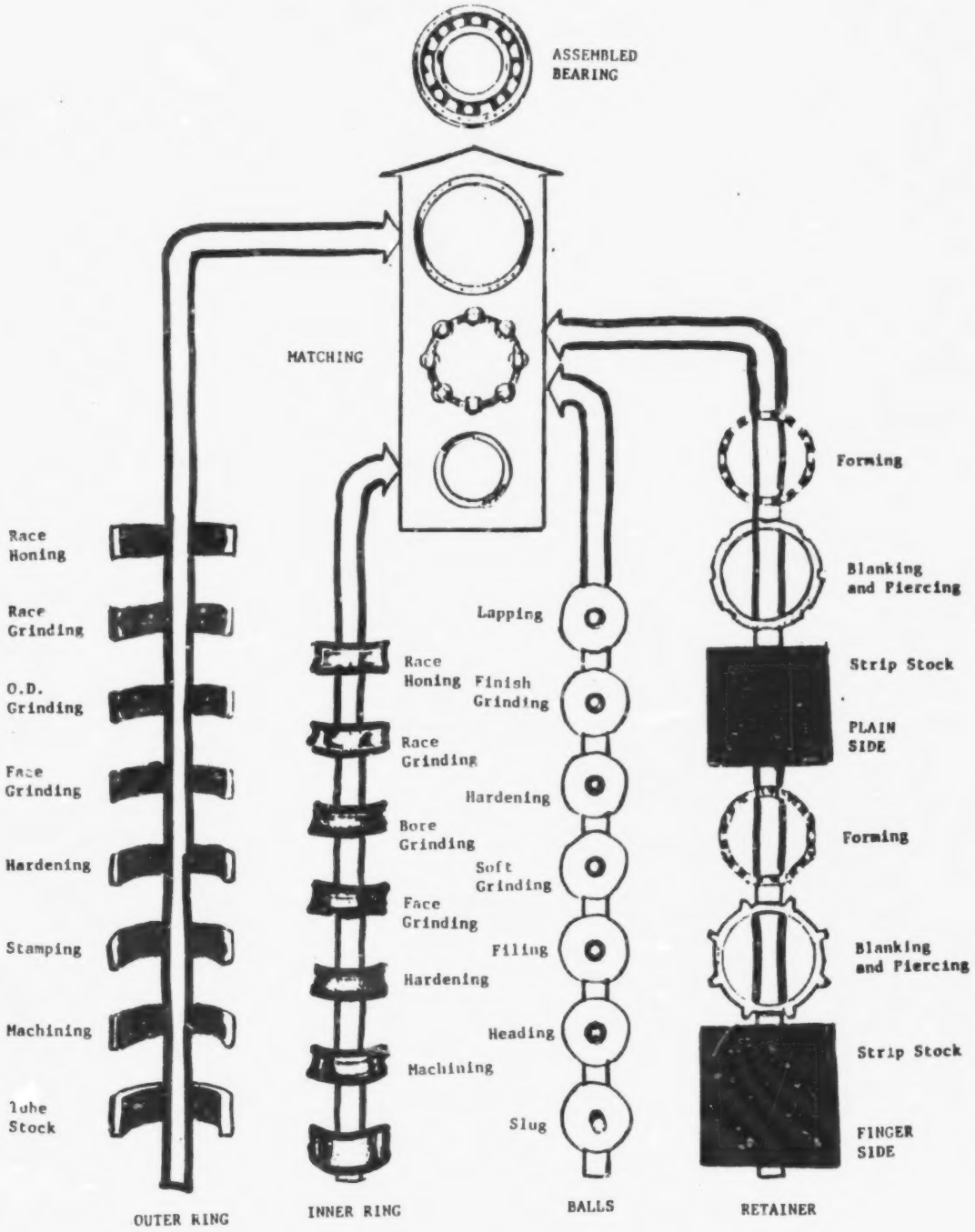
STEPS IN THE MANUFACTURE OF A BALL BEARING



Source: Fafnir Bearing Co.

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APPENDIX E
BEARING PARTS AND THEIR NAMES AND TYPES OF ANTIFRICTION BEARINGS

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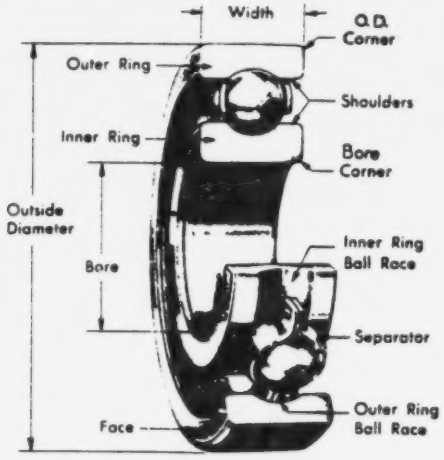
Bearing Parts and Their Names

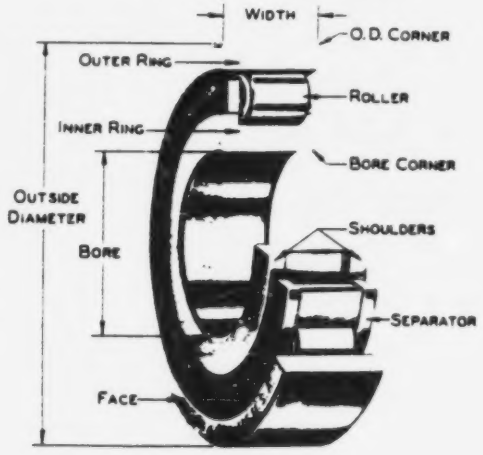
The parts common to all standard ball and roller bearings have, for the purpose of this manual, been given names as shown below.

Basically all anti-friction bearings consist of two hardened steel rings, the hardened balls or rollers and separator. A number of variations of these types are in use. Some types, such as Needle roller bearings may be used without an inner ring, the rollers fitting directly upon the hardened shaft. Needle bearings have no separator.

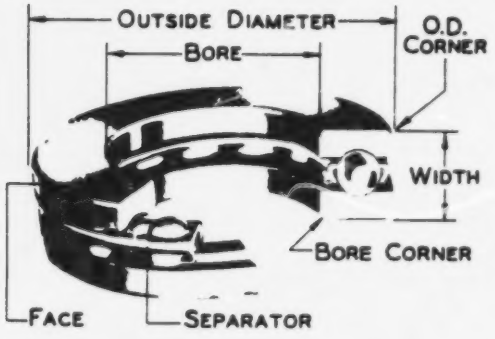
Ball Bearing



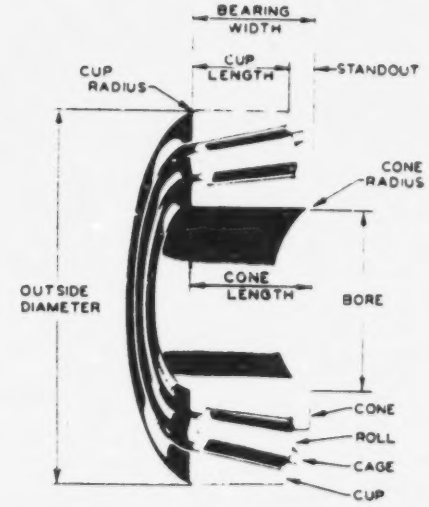
Straight Roller Bearing



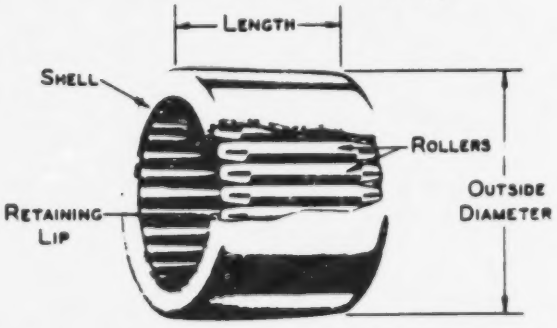
Ball Thrust Bearing



Tapered Roller Bearing



Needle Roller Bearing



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Types of Anti-friction Bearings

Ball Bearings

*1. Duplex bearings are specially face ground for use in pairs.

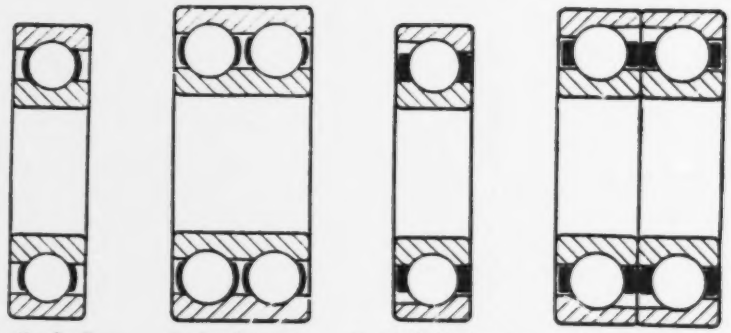
*5. Snap Ring bearings are used both with and without shields.

*6. Shields may be on either one or both sides.

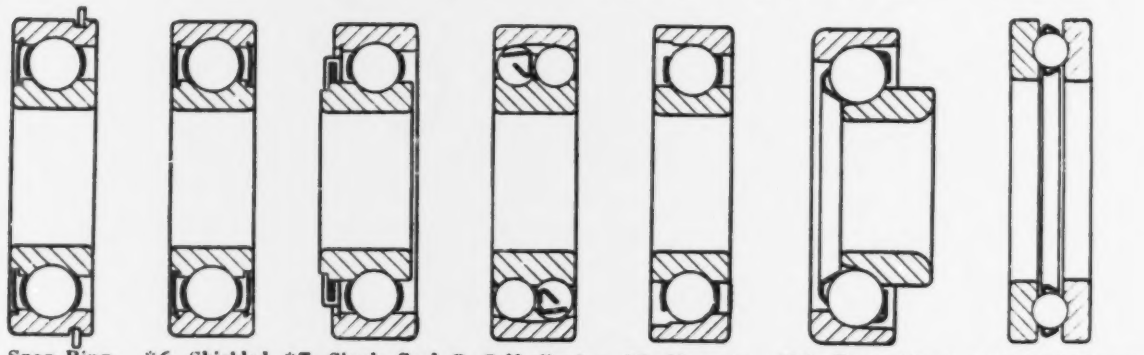
*7. Sealed bearings may have seals on both sides—are then wider.

*9 & 10. Magneto and Front Wheel bearings are separable.

*11. Ball Thrust bearings are treated separately on pages 16 and 17.



1. Single Row 2. Double Row 3. Radial-Thrust *4. Duplex



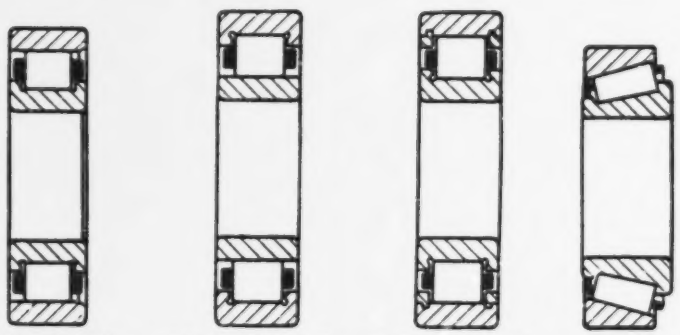
*5. Snap Ring *6. Shielded *7. Single Seal 8. Self-aligning *9. Magneto *10. Front Wheel *11. Ball Thrust

Roller Bearings

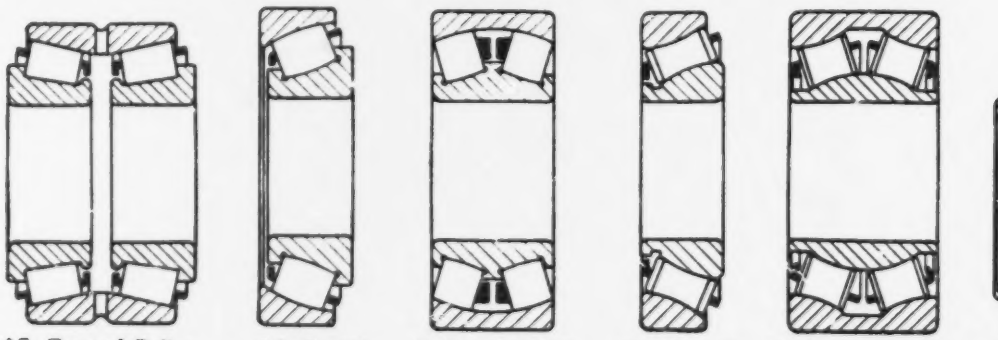
*1, 2, 4, 5, 6, & 8. These bearings are all separable either as to inner or outer rings.

*5. Double Row tapered roller, adjustable through cones. Also made adjustable through the cups.

*10. In some cases needle bearings may have inner rings which are separable.



*1. Straight Roller Separable outer ring *2. Straight Roller Separable inner ring 3. Straight Roller Non-separable *4. Tapered Roller



*5. Tapered Roller Double Row *6. Barrel Roller 7. Barrel Roller Double Row *8. Concave Roller 9. Concave Roller Double Row *10. Needle Roller

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APPENDIX F

SELECTED PORTIONS OF THE TARIFF SCHEDULES OF THE UNITED STATES ANNOTATED (1985)

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Explanation of the rates of duty applicable to mounted and unmounted ball and roller bearings and parts

The rates of duty in column 1 are most-favored-nation (MFN) rates and are applicable to imported products from all countries except those Communist countries and areas enumerated in general headnote 3(d) of the Tariff Schedules of the United States (TSUS). The People's Republic of China, Hungary, Romania, and Yugoslavia are the only Communist countries currently eligible for MFN treatment. However, MFN rates do not apply if preferential tariff treatment is sought and granted to products of developing countries under the Generalized System of Preferences (GSP) or the Caribbean Basin Economic Recovery Act (CBERA), or to products of Israel or of least developed developing countries (LDDC's), as provided under the Special rates of duty column.

Preferential rates of duty in the Special column followed by the code "D" reflect the full U.S. MTN concession rates implemented without staging for particular products of LDDC's enumerated in general headnote 3(e)(vi) of the TSUS. Where no rate of duty is provided for LDDC's in the Special column for a particular tariff item, the rate of duty in column 1 applies.

The rates of duty in column 2 apply to imported products from those Communist countries and areas enumerated in general headnote 3(d) of the TSUS.

The GSP affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974, was implemented by Executive Order No. 11888 of November 24, 1975, and renewed in title V of the Trade and Tariff Act of 1984. It applies to merchandise imported on or after January 1, 1976, and is scheduled to remain in effect through July 4, 1993. It provides duty-free entry to eligible articles imported directly from designated beneficiary developing countries. Eligible articles are identified in the Special column with the duty rate of "Free" followed by an "A" or "A*." The designation "A" means that products of all beneficiary developing countries are eligible for benefits of the GSP, and "A*" indicates that products of certain developing countries, specified in general headnote 3(e)(v)(D) of the TSUS, are not eligible.

The CBERA affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67 and implemented by Presidential Proclamation 5133 of November 30, 1983, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984; it is scheduled to remain in effect until September 30, 1995. It provides duty-free entry to eligible articles imported directly from designated Basin countries, as reflected by the rate of duty "Free" followed by the code "E" in the Special column. (See general headnote 3(e)(i) and (vii) of the TSUS.)

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Preferential rates of duty in the Special column followed by the code "I" reflect the rates of duty applicable to products of Israel under the United States-Israel Free Trade Area Implementation Act of 1985, as provided in general headnote 3(e)(viii) of the TSUS. Where no rate of duty is provided for products of Israel in the Special column for a particular tariff item, the rate of duty in column 1 applies.

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Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty		
				1	Special	2
678.50 (con.)		Machines not specially provided for, and parts thereof (con.):				
		Combination machines containing tape players (con.):				
		Phonograph-tape player combinations and radio-phonograph-tape player combinations:				
		Radio-phonograph-tape player combinations:				
	65	Cartridge type	No.			
	66	Other	No.			
	67	Other	No.			
	72	Combinations incorporating a Citizens Band (CB) transceiver	No.			
	75	Other	X			
		Other:				
		Industrial robots and parts thereof:				
	86	Robots	No.			
	87	Parts	X			
	95	Other	X			
678.51	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	X	Free		
		Subpart J. - Parts of Machines				
		Subpart J statistical headnote: 1. For the purposes of statistical reporting of ball bearings provided for under item 680.37, a radial bearing is one primarily designed to support its load perpendicular to the shaft axis.				
680.05	00	Molding boxes for metal foundry	No.	6.7% ad val.	5.7% ad val.(D) Free (A,E,I)	45% ad val.
680.07	00	Molders' patterns for the manufacture of castings	No.	4.7% ad val.	4.2% ad val.(D) Free (A,E,I)	30% ad val.
		Molds of types used for metal (except ingot molds), for metallic carbides, for glass, for mineral materials, or for rubber or plastics materials:				
		Molds used for rubber or plastics materials:				
680.11	00	Shoe machinery molds	No.	Free		Free
680.12		Other		4.3% ad val.	3.9% ad val.(D) Free (A,E,I)	35% ad val.
	10	Injection	No.			
	15	Compression	No.			
	20	Blow	No.			
	25	Bladder operated (tire)	No.			
	30	Other	No.			

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Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty		
				1	Special	2
		Taps, cocks, valves, and similar devices, however operated, used to control the flow of liquids, gases, or solids, all the foregoing and parts thereof (con.):				
		Other:				
680.25	00	Ballcock mechanisms, and parts	X	4.3% ad val.	3.9% ad val.(D) Free (A,E,I)	35% ad val.
680.27		Other		4% ad val.	3.7% ad val.(D) Free (A,E,I)	35% ad val.
	20	Safety and relief valves	No.			
	40	Other	X			
680.28	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	X	Free		
680.30		Antifriction balls and rollers		5.5% ad val.	4.9% ad val.(D) Free (E,I)	45% ad val.
		Balls:				
	25	Alloy steel	Lb.			
	30	Other	Lb.			
	40	Rollers	Lb.			
680.31	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	Lb.	Free		
		Ball or roller bearings, including such bearings with integral shafts, and parts thereof:				
680.33	00	Ball bearings with integral shafts	No.	4.7% ad val.	4.2% ad val.(D) Free (E,I)	35% ad val.
680.34	00	If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	No.	Free		
		Other:				
680.37		Ball bearings, and parts thereof		11% ad val.	Free (E) 8.8% ad val.(I)	67% ad val.
		Radial ball bearings, having an outside diameter of:				
	04	Under 9 mm	No.			
	08	9 mm and over but not over 30 mm	No.			
	12	Over 30 mm but not over 52 mm	No.			
	17	Over 52 mm but not over 100 mm	No.			
	18	Over 100 mm	No.			
	22	Ball bearings, other than radial	No.			
		Parts of ball bearings (including parts of articles provided for in item 680.33):				
	27	Inner races and outer races (including inner and outer races of integral shaft bearings provided for in item 680.33)	No.			
	28	Other parts	Lb.			
680.38		If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)		Free		
		Ball bearings and parts:				
	20	Ball bearings	No.			
	30	Parts of ball bearings	Lb.			

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Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty		
				1	Special	2
		Ball or roller bearings, including such bearings with integral shafts, and parts thereof (con.):				
		Other (con.):				
680.39		Other	.....	8.1% ad val.	6.5% ad val.(D) Free (E,I)	67% ad val.
		Tapered roller bearings and parts:				
	32	Cup and cone assemblies imported as a set	No.			
	34	Cups imported separately	No.			
	38	Cone assemblies imported separately	No.			
	40	Other parts	Lb.			
		Spherical roller bearings and parts:				
	52	Spherical roller bearings	No.			
	56	Parts	Lb.			
	60	Other roller bearings (including combination roller and ball bearings) and parts	Lb.			
680.41		If Canadian article and original motor-vehicle equipment (see headnote 2, part 6B, schedule 6)	.....	Free		
		Tapered roller bearings and parts:				
	40	Cup and cone assemblies imported as a set	No.			
	44	Cups imported separately	No.			
	48	Cone assemblies imported separately	No.			
	52	Other parts	Lb.			
	70	Other roller bearings (including combination roller and ball bearings) and parts	Lb.			
680.42	00	Forged steel grinding balls	Lb.....	4.7% ad val.	4.2% ad val.(D) Free (A,E,I)	27.5% ad val.

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Item	Stat. Suffix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty Special	Rates of Duty 2
		Gear boxes and other speed changers with fixed, multiple, or variable ratios; pulleys and shaft couplings; pillow blocks; flange, take-up, cartridge, and hanger units; torque converters; chain sprockets; clutches and universal joints; all the foregoing (except parts of agricultural or horticultural machinery and implements provided for in item 666.00 and parts of motor vehicles and bicycles) and parts thereof:				
		Gear boxes and other speed changers, and parts thereof:				
		Fixed ratio speed changers, multiple and variable ratio speed changers each ratio of which is selected by manual manipulation, and parts thereof:				
680.46	.00	Imported for use with machines for making cellulosic pulp, paper, or paperboard	X	0.9% ad val.	Free (A,D,E,I)	27.5% ad val.
680.49		Other		3% ad val.	2.5% ad val.(D) Free (A,E,I)	27.5% ad val.
	10	Fixed ratio speed changers	No.			
	40	Multiple and variable ratio speed changers each ratio of which is selected by manual manipulation	No.			
	60	Parts	X			
680.59	00	Other speed changers	No	65c each + 10.2% ad val.	50c each + 7.7% ad val.(D,I) Free (A,E)	$4.50 each + 65% ad val.
680.61	00	If certified for use in civil aircraft (see headnote 3, part 6C, schedule 6)	No	Free		$4.50 each + 65% ad val.
680.62	00	Other parts	X	12.6% ad val.	9% ad val.(D,I) Free (A,E)	65% ad val.
680.63	00	If certified for use in civil aircraft (see headnote 3, part 6C, schedule 6)	X	Free		65% ad val.
		Pulleys and shaft couplings, and parts thereof:				
680.92	00	Gray-iron awning or tackle pulleys, not over 2 1/2 inches in wheel diameter	X	6.7% ad val.	5.7% ad val.(D) Free (A,E,I)	45% ad val.
680.95		Other		6.7% ad val.	5.7% ad val.(D) Free (E,I)	45% ad val.
	15	Pulleys and parts thereof	X			
	30	Shaft couplings and parts thereof	X			
681.01	00	If certified for use in civil aircraft (see headnote 3, part 6C, schedule 6)	X	Free		45% ad val.
		Pillow blocks and parts thereof:				
681.04		Ball or roller bearing type		6.7% ad val.	5.7% ad val.(D) Free (E,I)	45% ad val.
	10	Pillow block units	No.			
	30	Parts	X			
681.07	00	Other types	X	6.7% ad val.	5.7% ad val.(D) Free (E,I)	45% ad val.
		Flange, take-up, cartridge, and hanger units, and parts thereof:				
681.10		Ball or roller bearing type		6.7% ad val.	5.7% ad val.(D) Free (A,E,I)	45% ad val.
	10	Complete units	No.			
	30	Parts	X			
681.13	00	Other types	X	6.7% ad val.	5.7% ad val.(D) Free (A,E,I)	45% ad val.
681.15	00	Torque converters, and parts thereof	X	3.7% ad val.	3.4% ad val.(D) Free (A,E,I)	27.5% ad val.
681.18	00	If certified for use in civil aircraft (see headnote 3, part 6C, schedule 6)	X	Free		27.5% ad val.

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APPENDIX G

U.S. RATES OF DUTY AS MODIFIED BY THE PRESIDENT IN 1974

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Table G-1.--Temporary rates of duty on radial ball bearings, 9-100mm, as of May 1, 1974, May 1, 1976, and May 1, 1977

TSUS Item No.	Description	May 1, 1974	May 1, 1976	May 1, 1977 1/
	Ball bearings, radial, provided for in item 680.35 of 4J of schedule 6:			
923.80	Having an outside diameter of 9mm and over, but not over 30mm and valued not over 60¢ each	20% ad val.	16% ad val.	12% ad val.
923.82	Having an outside diameter of over 30mm, but not over 52mm and valued at not over 75¢ each	20% ad val.	16% ad val.	12% ad val.
923.84	Having an outside diameter of over 50mm, but not over 100mm and valued not over $1.30 each	3.4¢ per lb. + 15% ad val.	3.4¢ per lb. + 15% ad val.	2.6¢ per lb. +11% ad val.

1/ At the close of April 30, 1978, these rates reverted to column 1 rates of duty.

Source: Tariff Schedules of the United States Annotated (1972), as amended by Presidential Proclamation 4279, Mar. 29, 1974, 39 F.R. 11861.

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APPENDIX H

BALL AND ROLLER BEARINGS AND PARTS THEREOF: U.S. IMPORTS AND EXPORTS

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Table H-1.--Ball and roller bearings and parts: U.S. imports for consumption, by principal sources, 1980-84, January-June 1984, and January-June 1984

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Japan	185,601	199,786	186,122	182,073	297,299	124,680	165,052
Fr Germ	112,714	88,199	83,705	70,658	97,396	47,476	48,399
Canada	46,524	47,324	44,830	51,878	62,463	31,773	30,647
Singapr	18,646	15,349	26,100	25,219	30,806	13,760	17,127
Italy	15,211	22,550	16,645	17,301	28,562	13,091	12,856
U King	31,994	37,002	33,732	17,827	25,328	13,391	11,346
France	13,255	14,015	10,932	9,311	16,182	7,909	10,040
Sweden	20,392	21,475	13,520	10,644	15,021	7,563	7,871
Romania	10,804	13,996	15,496	13,340	13,003	4,168	9,052
Switzld	6,692	5,158	5,079	5,454	6,928	3,328	3,277
All other	26,980	19,706	17,437	19,667	34,617	17,455	20,251
Total	488,814	484,562	453,598	423,374	627,603	284,173	335,918

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-2.--Ball bearings, complete: U.S. imports for consumption, by principal sources, 1980-1984, January-June 1984, and January-June 1985

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Japan	103,045	109,853	93,564	85,763	130,892	56,985	76,180
W. Germany	55,672	44,262	35,044	33,060	41,413	20,258	19,986
Canada	27,848	25,356	23,912	24,941	28,216	14,618	13,792
Italy	10,176	16,446	11,644	14,631	24,195	11,420	10,136
Singapore	13,966	11,770	18,690	19,363	21,245	11,110	9,701
France	6,832	7,079	5,688	4,736	8,453	4,616	5,042
U King	11,463	9,965	6,380	3,882	8,443	4,328	4,701
Romania	6,072	8,118	6,415	8,314	7,513	2,433	4,770
Sweden	5,255	5,505	4,880	4,016	5,857	2,971	3,127
Switzld	4,110	3,085	3,342	3,520	4,590	2,139	1,988
All other	18,739	12,768	13,035	7,692	13,938	5,749	9,845
Total	263,179	254,206	222,594	209,918	294,753	136,627	159,268

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-3.--Tapered roller bearings, cups and cones: U.S. imports for consumption, by principal sources, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	1985
Japan	40,929	42,853	48,683	61,241	111,300	43,138	55,657
Canada	10,114	11,720	11,230	17,609	22,465	12,202	10,934
Fr Germ	3,458	2,644	5,680	4,273	6,745	3,728	3,278
U King	3,239	6,763	10,364	3,823	2,791	1,513	943
Romania	3,398	4,443	6,304	4,181	2,791	910	3,124
Yugoslv	-	-	18	688	2,148	980	810
Brazil	394	1,081	1,025	1,313	2,087	1,398	1,099
Hungary	13	1	1	1,594	1,637	474	788
France	1,130	534	1,515	1,118	1,479	558	1,419
Spain	4	16	40	3	1,289	508	409
All other	3,553	2,816	3,186	1,533	3,302	2,214	1,100
Total	66,232	72,872	88,044	97,375	158,035	67,623	79,561

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-4.--Other roller bearings, complete: U.S. imports for consumption, by principal sources, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	1985
Fr Germ	46,722	35,406	37,343	29,055	40,172	19,875	19,977
Japan	11,519	13,676	15,993	10,760	17,880	6,616	11,737
U King	10,260	16,259	14,163	7,869	9,659	5,186	3,891
Singapr	4,663	3,477	6,734	5,226	9,344	2,500	7,337
Sweden	14 572	15,529	8,332	6,096	8,080	3,820	4,564
Canada	5,697	8,185	8,009	7,690	7,576	3,434	3,953
Italy	1,910	2,585	2,510	1,910	3,129	1,214	1,943
France	3,922	4,091	2,040	2,099	2,985	1,349	2,111
Romania	1,110	1,350	2,462	835	2,572	732	934
Austria	2,058	2,326	3,578	2,548	1,886	1,006	1,104
All other	4,281	3,332	3,576	3,124	5,193	2,544	3,497
Total	106,712	106,214	104,741	77,211	108,475	48,276	61,048

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table H-5.--Parts and components for balls and roller bearings sold separately: U.S. imports for consumption, by principal sources, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Japan	25,938	28,691	22,924	17,073	30,283	14,728	18,183
Fr Germ	6,516	5,704	2,786	3,938	8,280	3,297	4,870
Canada	2,717	1,854	1,001	1,210	3,616	1,368	1,460
France	1,339	2,295	410	1,274	3,256	1,383	1,465
U King	4,614	2,711	1,373	1,516	2,963	1,604	1,464
China t	166	130	253	865	1,881	959	1,127
Sweden	382	317	161	407	804	649	147
Switzld	339	380	278	595	783	416	348
Italy	2,167	1,336	576	414	576	189	339
China M	-	-	-	103	472	113	296
All other	1,112	1,097	2,365	2,063	2,133	1,887	1,245
Total	45,290	44,515	32,126	29,457	55,048	26,593	30,944

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-6.--Mounted bearings, except plain: U.S. imports for consumption, by principal sources, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Source	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Japan	4,423	4,714	4,249	7,236	6,944	3,212	3,295
U King	2,387	1,304	832	737	1,471	759	347
Kor Rep	-	-	19	230	933	255	381
Fr Germ	301	184	172	333	787	319	285
Canada	116	209	510	429	590	151	507
China t	82	86	177	262	256	170	241
Sweden	24	74	25	57	149	80	17
Mexico	-	-	-	-	84	81	-
Switzld	1	1	-	14	23	2	-
Nethlds	13	8	6	2	10	1	2
All other	54	176	105	113	44	24	23
Total	7,401	6,755	6,093	9,413	11,292	5,054	5,098

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-7.--Ball and roller bearings: U.S. exports of domestic merchandise, by principl markets, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	1985
Canada	92,914	103,090	78,058	83,555	110,381	57,151	58,791
Mexico	52,067	57,155	32,358	18,970	38,998	16,669	22,922
Fr Germ	18,268	21,068	19,431	18,435	21,542	10,785	13,509
U King	18,534	15,017	17,915	13,755	16,793	7,560	9,354
Austral	15,286	15,250	13,340	10,762	13,942	8,106	4,789
Belgium	12,794	11,438	12,618	8,506	11,572	5,641	5,266
Venez	10,946	13,171	13,437	5,696	11,416	4,839	4,898
France	23,846	17,179	14,539	11,445	10,116	5,011	4,593
Brazil	15,801	15,201	9,732	6,361	9,280	3,847	5.979
Rep Saf	15,281	16,155	13,049	6,123	8,552	4,726	3,485
All other	92,769	97,167	85,838	69,528	77,988	39,361	27,919
Total	368,506	381,892	310,317	253,136	330,579	163,646	161,405

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-8.--Ball bearings, complete: U.S. exports of domestic merchandise, by principal markets, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	1985
Canada	24,210	23,929	16,317	17,329	23,860	13,406	10,282
Mexico	11,960	15,192	8,696	5,092	9,892	4,639	4,532
Fr Germ	5,077	4,321	4,519	4,302	5,609	2,995	3,957
U King	6,663	6,591	6,684	4,473	5,553	2,494	3,473
Nethlds	3,826	4,949	4,434	3,911	3,237	1,693	1,511
France	5,914	6,087	4,079	3,729	3,077	1,529	1,648
Japan	4,287	5,446	3,252	1,421	2,912	1,478	1,619
Belgium	3,783	3,272	3,425	2,203	2,875	1,465	1,363
Singapr	1,775	1,189	1,708	2,717	2,874	1,569	401
Venez	2,786	3,245	3,119	1,160	2,761	1,007	974
All other	23,428	27,485	20,895	18,076	18,051	7,702	7,625
Total	93,709	101,703	77,129	64,413	80,702	41,977	37,395

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table H-9.--Tapered roller bearings, cups, and cones: U.S. exports of domestic merchandise, by principal markets, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Canada	31,857	40,318	28,884	30,592	44,634	21,492	19,178
Mexico	22,284	26,329	11,031	7,619	18,114	7,510	11,492
Austral	7,602	8,054	6,360	4,707	7,329	3,914	2,214
Fr Germ	7,544	11,378	8,758	6,125	6,438	3,350	3,486
Venez	5,186	6,881	6,876	2,040	6,149	2,765	2,483
U King	5,493	2,419	5,381	3,919	6,102	2,774	3,319
Brazil	10,428	9,341	5,219	3,548	5,900	2,454	4,042
Rep Saf	9,749	9,726	8,459	4,351	5,211	2,907	2,063
France	14,672	7,973	6,808	5,418	5,091	2,312	1,817
Panama	1,259	960	469	895	3,551	2,136	443
All other	36,044	33,381	30,439	21,544	25,880	13,643	11,665
Total	152,119	156,760	118,683	90,758	134,397	65,257	62,202

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-10.--Roller bearings, complete: U.S. exports of domestic merchandise, by principal markets, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	January-June-- 1985
Canada	23,391	24,223	20,101	21,806	24,686	12,716	15,849
Fr Germ	3,771	2,766	4,709	6,862	7,748	3,363	5,135
Mexico	9,954	7,121	6,023	3,013	5,609	2,426	2,637
Belgium	6,854	5,314	4,747	3,597	5,366	2,495	2,170
Austral	4,051	3,886	4,219	2,861	3,708	1,960	1,370
U King	4,617	4,391	3,964	4,005	3,254	1,601	1,762
India	1,727	1,722	1,570	2,309	3,166	560	891
Japan	2,151	2,030	2,084	1,725	2,026	1,100	1,179
Venez	1,905	2,102	2,120	1,957	1,845	823	1,068
Singapr	1,639	1,429	1,200	1,192	1,374	699	582
All other	18,928	21,147	19,825	13,414	11,572	5,725	6,880
Total	78,589	76,132	70,563	62,741	70,354	33,468	39,523

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table H-11.--Parts and components for ball and roller bearings sold separately: U.S. exports of domestic merchandise, by principal markets 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	1985
Canada	8,247	9,269	6,431	5,437	6,666	3,340	3,483
Mexico	2,778	3,277	3,614	1,698	2,303	926	2,080
Fr Germ	1,847	2,003	1,160	725	1,592	975	787
U King	1,113	1,013	1,026	901	1,413	996	464
Brazil	663	744	457	84	971	368	301
China t	888	605	183	535	866	510	541
Japan	554	566	900	949	750	349	490
Rep Saf	130	158	250	63	650	563	11
Italy	582	514	461	298	618	339	578
Nethlds	639	628	507	647	604	322	470
All other	7,001	5,582	6,600	4,734	5,494	2,594	2,417
Total	24,442	24,359	21,589	16,069	21,926	11,282	11,622

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 12.--Mounted bearings, except plain: U.S. exports of domestic merchandise, by principal markets, 1980-84, January-June 1984, and January-June 1985

(In thousands of dollars)

Market	1980	1981	1982	1983	1984	January-June-- 1984	1985
Canada	5,210	5,351	6,325	8,393	10,535	6,197	4,358
Mexico	5,090	5,235	2,995	1,548	3,078	1,167	2,181
Phil R	607	723	903	526	951	273	315
Israel	56	222	190	451	695	424	367
U King	648	604	860	457	471	240	337
Japan	382	686	703	618	435	209	103
Brazil	462	683	246	260	425	62	141
Austral	241	438	437	245	404	173	111
Argent	302	98	189	272	399	156	55
Venez	663	693	1,003	379	389	121	313
All other	5,985	8,207	8,501	6,007	5,415	2,719	2,382
Total	19,647	22,938	22,353	19,156	23,199	11,711	10,663

Source: Compiled from official statistics of the U.S. Department of Commerce.

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APPENDIX I

COMPETITIVE ASSESSMENT OF U.S.- AND FOREIGN-PRODUCED BEARINGS IN U.S. AND FOREIGN MARKETS

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Table I-1.--Ball and roller bearings and parts: U.S. producers' competitive assessment of product-related factors of competition for U.S.- and Japanese-produced ball and roller bearings in the U.S. market, January 1980-June 1985

Item	U.S. advantage		Japanese advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice	X	X		
Quality, durability, and reliability of product			X	X
Reliability of supplier	X	X		
Financial terms			X	X
Service	X	X		
Warranties	X	X		
Availability of parts	X	X		
Historical supplier relationship	X	X		
Technical features and performance characteristics	X	X		
Engineering and design assistance	X	X		

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-2.--Ball and roller bearings and parts: U.S. producers' competitive assessment of product-related factors of competition for U.S.- and West German-produced ball and roller bearings in the U.S. market, January 1980-June 1985

Item	U.S. advantage		Japanese advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice	X	X		
Quality, durability, and reliability of product	1/	1/	1/	1/
Reliability of supplier	X	X		
Financial terms	1/			X
Service	X	X		
Warranties	X	1/		
Availability of parts	X	X		
Historical supplier relationship	X	X		
Technical features and performance characteristics	X	X		
Engineering and design assistance	X	X		

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-3.--Ball and roller bearings and parts: U.S. importers' competitive assessment of product-related factors of competition for U.S.- and Japanese-produced ball and roller bearings in the U.S. market, January 1980-June 1985

Item	U.S. advantage		Japanese advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice	X	X		
Quality, durability, and reliability of product			X	X
Reliability of supplier		1/	X	1/
Financial terms		X	X	
Service		1/	X	1/
Warranties	1/	1/	1/	1/
Availability of parts	1/	X	1/	
Historical supplier relationship	X	X	X	X
Technical features and performance characteristics		1/	X	1/
Engineering and design assistance		X	X	

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-4.--Ball and roller bearings and parts: U.S. importers' competitive assessment of product-related factors of competition for U.S.- and West German-produced ball and roller bearings in the U.S. market, January 1980-June 1985

Item	U.S. advantage		West German advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice	1/	1/	1/	1/
Quality, durability, and reliability of product		1/	X	1/
Reliability of supplier	1/	1/	1/	1/
Financial terms	1/	1/	1/	1/
Service	1/	1/	1/	1/
Warranties	X	1/		
Availability of parts	1/	1/	1/	1/
Historical supplier relationship	X	1/		1/
Technical features and performance characteristics		1/	X	1/
Engineering and design assistance	X	X		

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-5.--Ball and roller bearings and parts: U.S. purchasers' competitive assessment of the importance of various purchasing factors in their decision to buy

Item	Extremely important	Mid-range			Not at all important
		1	2	3	
Quality/durability/ reliability of products	42	4	0	0	0
Reliability of supplier	38	7	1	0	0
Price	29	12	4	0	1
Availability of parts	26	13	4	2	1
Service	25	13	5	3	0
Technical features/performance characteristics	25	9	8	3	1
Availability of product on short notice	21	15	9	1	0
Engineering and design assistance	20	12	6	5	2
Warranties	17	12	12	4	1
Historical supplier relationship	8	15	16	5	2
Exchange rate	6	7	10	8	15
Proximity of supplier	4	6	18	15	3
Alternative source	4	13	23	5	1
Financial terms 1/	1	7	5	4	0
Other	0	1	1	0	2

1/ Because of the omission of numbers in the questionnaire form, 29 firms did not respond to this line item.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-6.--Ball and roller bearings and parts: U.S. producers' competitive assessment of product-related factors of competition for U.S.- and Japanese-produced ball and roller bearings, in foreign markets, January 1980-June 1985

Item	U.S. advantage		Japanese advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice			X	X
Quality, durability, and reliability of product	1/	1/	1/	1/
Reliability of supplier	1/		1/	X
Financial terms			X	X
Service		X	X	
Warranties	1/	1/	1/	1/
Availability of parts		1/	X	1/
Historical supplier relationship		1/	X	1/
Technical features and performance characteristics	1/	X	1/	
Engineering and design assistance		X	X	

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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Table I-7.--Ball and roller bearings and parts: U.S. producers' competitive assessment of product-related factors of competition for U.S.- and West German-produced ball and roller bearings in foreign markets, January 1980-June 1985

Item	U.S. advantage		Japanese advantage	
	Ball bearings	Roller bearings	Ball bearings	Roller bearings
Overall competitive advantage			X	X
Purchase price			X	X
Exchange rate			X	X
Availability of product on short notice			X	X
Quality, durability, and reliability of product	1/	1/	1/	1/
Reliability of supplier			X	X
Financial terms			X	X
Service			X	X
Warranties	1/	1/	1/	1/
Availability of parts		1/	X	1/
Historical supplier relationship			X	X
Technical features and performance characteristics	1/	1/	1/	1/
Engineering and design assistance			X	X

1/ Same or nearly the same competitive advantage.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

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